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GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

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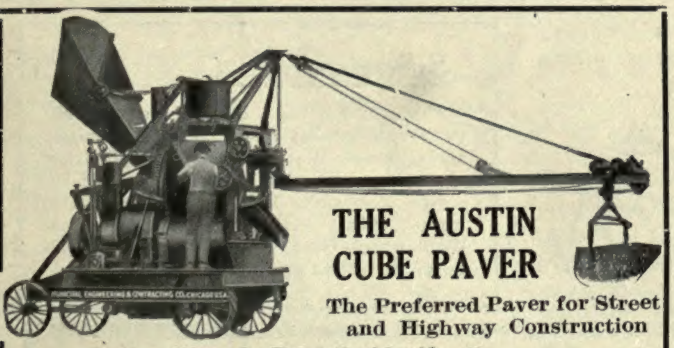

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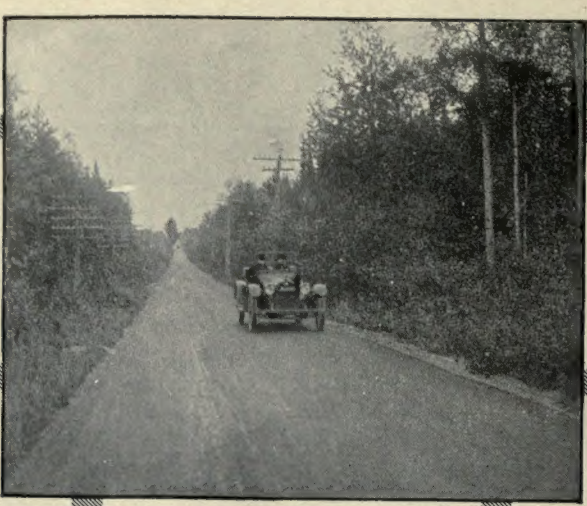

Three different sections of Marquette-Negaunee Road, Marquette County, Mich. These roads were water-bound macadam, surface-treated with "Tarvia-B" in 1917 and 1918. This is the main line of travel between the busy mining cities of Ishpeming and Negaunee, Mich. A traffic census revealed the passage over this road of 1080 vehicles per hour, the majority of which were automobiles.

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GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

WITH WHICH IS INCORPORATED

THE HIGHWAY CONTRACTOR AND ROAD BUILDER

Old Series. Vol. LVIII.
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NEW YORK, JANUARY 7, 1920

Number
1

The American Highway Problem[*]

By A. R. HIRST[†]

We commence today, in this our annual meeting, what I sincerely feel is the most momentous highway gathering ever held in America. For the past few years the overwhelming shadow of the world war has hung over all our deliberations. Everything else was so secondary to the issues fought for and won in that great struggle that even those of us who most implicitly believed in the importance of highway work in America felt that highways and work upon them should be subordinated to the other and greater world purposes.

We did, however, fight and fight successfully in order that the great highway movement be not utterly crushed in the midst of the manifold demands of war, because we felt that by keeping together the nucleus of a highway organization, despite many short-sighted attacks, we were doing the American people a real service. It was not pleasant work, nor profitable, to those of us who were in the midst of the storm. But it was worth while and the fight was won, even though for a time the production of ukuleles was ruled by the powers that be as more important than the production of highways.

The New Era

But now all is changed. The American people, almost as one man, are demanding, and that instantly, a modern and comprehensive system of highways and are willing to pay the price. They have at last realized that the price of building highways which will serve the needs of the present and of the logically to be expected traffic is far less than the price they must pay if the present embargo of mud continues. Never, I believe, since the days of early railroad development have the American people been so determined to change instantly their means of transport and not even then were they so willing to pay the cost, provided they could get the results.

What are the results they are now demanding and what are some of the problems that grow from these demands?

They are expecting the states which had no highway organizations three or even two years ago, which had done no preliminary work and in some of which hardly a mile of modern rural highway had ever been built, to create an organization full sprung from the earth (like our imaginary defensive and agressive army was to spring) and to build instantly hundreds of miles of modern roads costing millions upon millions of dollars. In the older states in the highway game, better prepared with organizations and contractors, and with some knowledge of material and construction conditions they are asking us to double, triple or quadruple our annual output of roads. It is probably fair to estimate that the expenditure for modern highways in rural America in 1919 was about $200,000,000 and that the sum desired to be expended for them in 1920 exceeds $600,000,000. In other words, the people of America desire to approximately triple their highway expenditures and to do it in one year.

We are wont to think of the era of railroad building in America as presenting the greatest of engineering problems and that its solution was an astounding exhibition of the capacity of American engineering genius. However, the problem confronting American highway engineers today far exceeds the old one in magnitude. In the record five years of railroad development (1879 to 1883, inclusive) there were built 40,000 mi. of railroad costing, as nearly as I can ascertain, about $20,000 a mile, on the average, or $800,000,000 in all. In the five years from 1920 to 1925, inclusive, the American highway engineer will be expected to build probably 100,000 mi. of highway costing not less than $3,000,000,000. Even allowing for the depreciated dollar, the yardage of earth to be moved, the amount of materials to be furnished and transported, and the labor required are probably at least double that required in the former enterprise.

Some of Our Problems

It may be of interest to list some of the tremendous problems facing the executives of state highway departments in this work of speeding up the national highway program to meet the American demand.

1. The Problem of Trained Engineering Help to Make the Surveys and Plans, the Preliminary Investigations and to Perform the Inspection

This is a problem largely for American educators, but with the present shortage and the very restricted output of young engineers, due to the war, it is an acute one demanding immediate attention. I might add that, in my opinion, a four-year course is longer than is necessary for the preparation of much of the help that is needed, and a solution should be sought along the lines of the winter short courses of our agricultural colleges. We must have hundreds, yes thousands, of trained men at the earliest possible date and four or five years hence will not do.

2. The Problem of Materials of Construction

Nothing is more certain than that there will be an acute shortage of materials in 1920 and thereafter, unless there is substituted in place of the present hit and miss methods an intensive study of all available road materials in every state, and unless the most strenuous methods are used to develop every available source of supply. The expensive production and delivery of road materials during the winter season is going to be necessary, especially in the northern states with short construction seasons. Every state must establish a road materials department, the sole function of which will be to locate, test, develop, and arrange for the proper delivery of all available materials. Already there are rumors of combinations of material men to purchase and control all sources of highway materials. It is up to the states to protect their people by getting sufficient material sources in state and county hands before it is too late.

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[*] Presidential address at the 5th annual meeting of the American Association of State Highway Officials, Louisville, Ky., Dec. 8-11, 1919.

[†] State Highway Engineer of Wisconsin; President, American Association of State Highway Officials.

3. The Problem of Cement

It seems obvious that much, if not all of the so-called permanent surfacing will be either cement concrete or other surfacings on a cement concrete base, and that practically all drainage structures will be built of concrete. Unless there can be had the most absolute and fair federal control of the price of cement the bidding between municipalities and states and between contractors for cement is apt to drive the price up to the point of impossibility. The lack of federal control, the erection or purchase by the states of cement mills or state control of the output of certain mills would seem to be only a rudimentary conception of the duty of protecting the public against unduly inflated prices. The present unfair arrangement between manufacturers and dealers whereby dealers who never see or handle the cement must be paid hundreds of dollars for every mile or road built of concrete or with a concrete base must also be controlled effectively. States which buy millions of barrels of cement annually and pay always (no bad accounts) must get at least the dealer's price.

4. The Problem of Car Service

Car service has been execrable on practically every railroad. We have been handicapped day after day and month after month by the criminal neglect of the present railroad officials to recognize the fact that highway building is a great American industry. If construction is to be carried on with materials delivered by rail, better car service, and in the northern states, a longer season for shipments is necessary. Possibly the time will soon return when freight revenues will mean something to American railroads and when it will not be an insult to a railroad man to offer his company freight business. I sincerely hope so. Until then we ought not to depend on materials involving a railroad haul except where no other source of supply is humanly possible. If the railroads are allowed to come out of their present state of coma and will give us the proper type of cars, enough of them, and reasonable service at fair prices in the installation of unloading sidings conveniently near the work, their revenues can be very materially increased, our costs decreased, and our work speeded up.

Who but a hopeless theorist could have devised the present system of railroad control wherein it's no one's business to get business, and the less business a railroad does the less the wear and tear on its roadbed and equipment and the greater its real profit? If you guarantee a man a fixed income for a term of years, whether he does much, or little, or nothing, what is the inevitable result?

And yet it is seriously proposed to continue the present soporific arrangement, which has killed all railroad initiative, hamstrung all legitimate business and left us a nation with its primary circulatory system fitted with a tourniquet on every artery. The latest far-seeing exhibition of genius is the granting of time and a half for overtime on slow freights, whereby it is happily made possible for every freight train crew to greatly increase its earnings by making slower time!

Even in this railroad problem we must interest ourselves because we can never build our roads unless this American "sleeping beauty," our railroad system, is given an injection of dynamite and made to live again.

5. The Problem of Efficient Construction Organizations and Fair Prices

The contracting problem we always have with us. We need every competent highway builder available and we need to immediately multiply his number two to five times in the various states. We must encourage those good contractors who are now available and develop many new ones. To do this good prices will have to be paid and fair treatment given. On the other hand, we must not hand over our clients' pocketbooks to the contractors with the injunction: "Take what you think is right, but please return us the cover." Unless some restraint is exercised, with the amount of work there is to be done and with the universal feeling existing that "My road must be built no matter what it costs," prices will be driven up and up without regard to proper cost, values or profits.

In this connection, it is my belief that each state should immediately develop a moderately large construction organization fully equipped to do a portion of all classes of its work. Then in case prices on certain work are extortionate, the work may be done by force account. This plan has the advantage of developing and training the nucleus of a larger day labor organization, if one should later prove necessary. It also gives at all times a true index of the cost of various kinds of work on the basis of actual and recent state experience. We cannot know the actual cost of work unless we are actually in the construction game.

Every state has availed itself, I believe, of the offer of war equipment from the Federal Government. Large supplies of many things useful in highway work, especially motor trucks, have been or will be received. The organization of a proper department to receive, fit for use, and handle this equipment is no mean problem. The states should carefully consider whether this equipment should not be made the basis of building up a permanent thoroughly well equipped day labor organization as a means of protecting itself now and in the years to come.

I also believe it necessary for adjoining states to cooperate with a view of keeping prices for work fair and uniform under the same conditions. If adjoining states are going to bid against each other the cost of work in all of them will be sent up to the prohibitive point without any ultimate advantage to any state. It should be possible for the states to get together on this matter. Costs are quite figurable for each job and with a uniform system of allowances for the use of machinery, profits, and contingencies it should be possible possible to put work in all states on an approximately equal basis of attractiveness. These allowances must be generous, because we must attract the best contractors, but they need not, and should not, be wasteful. This problem is the most acute of all our problems and should be given immediate and serious attention by every state. I can think of no way in which more millions can be unnecessarily spent in the next few years than by allowing unbridled and useless competition for contractors and materials to prevail between municipalities.

6. The Problem of Labor

We speak blithely of millions of dollars for the construction of thousands of miles of road. This program means men, far more men than have ever been employed in this work before. But men are scarce and other productive labor must not be raided. Our farms, our mines, our factories, and our mills must be allowed to produce largely and at a reasonable cost. We should not pay our labor, or allow such prices to contractors as will enable them to pay their labor, a sum per day greatly in excess of the going wage for like work in that vicinity. Whether we pay high prices for labor or whether the contractor does, it is our responsibility, because the prices we pay for work determine the prices which can be paid for labor. In other words, we must not bull the labor market to the disadvantage of other production. This is public work; its continuance depends upon the support of the whole public, and we must be careful not to alienate this support by forcing our work at undue prices, thus upsetting local labor situations. This policy is not only right from the standpoint of expediency, but is also economically sound.

7. The Problem of Improved Location and Alignment

We have, in the past, been too prone to build along the old established lines of highways. This has been the easy course and it has been taken. But the new traffic conditions are so different and so intense that in considering the construction of a main trunk highway all the old governing considerations, such as saving the buying of new lands for right of way, utilizing old cuts and fills, saving an existing bridge or a few good culverts, no longer bind us to the old location. We must connect the centers of population because they are the points from which things and persons come and to which they wish to go. In building a modern highway between these fixed points we can feel free to exercise our untrammelled judgment and build where the road will ultimately cost the public the least. Shortness of distance, freedom from dangerous curves and from railroad grade crossings, and reasonable grades are now the principal ends to be sought and practically nothing else counts.

Cost of construction has become secondary. If the very conservative sum of 10 ct. per mi. is allowed for each mile of travel saved, the saving of a mile in distance on highways carrying the following average number of vehicles per day will save the traveling public the given amount per year, which is the interest at 5% on the amount given in the third column.

VALUE OF A MILE IN HIGHWAY DISTANCE SAVED

Average Number of Vehicles per Day	Saving to Owners Per Year	Saving Capitalized at 5 per cent Equals
100	$ 3,650	$ 73,000
250	9,125	182,500
500	18,250	365,000
750	27,375	547,500
1,000	36,500	730,000
2,000	73,000	1,460,000
5,000	182,500	3,650,000
10,000	365,000	7,300,000

I believe that these figures are unassailable and that they demonstrate that when building our main highways for all the years to come, saving in distance in the layouts is the supreme consideration and should be given much more attention.

Many other important problems could be named and briefly commented on but this paper will be too long if continued along these lines. I cannot, however, resist naming, without comment, some of the other things with which an efficient state highway department must also concern itself.

8. A proper System of Records of the Cost of all Construction and of Accounting for all Funds Available.

9. Proper Publicity of Plans and Results, not only in the Local Press, but in the National Press.

10. Proper Care of Traffic During Reconstruction.

11. Proper Touring Maps for the Information of the People of the State and of other States.

12. Proper Marking of the Main Traveled Roads, Keyed to the State Maps.

13. Proper Accommodations for the Traveling Public in the Way of Garages, Hotels, Public Parking Places, and Comfort Stations.

14. Complete Knowledge and Study of, and, if necessary, the Design of Labor and Time Saving Devices and Equipment.

15. A Study of Plant Layouts and Equipment for Various Types of Construction under Varying Conditions.

16. A Study of the Grade Crossing Situation and a Strong Campaign for Improved Conditions.

17. The Holding of Road Schools and Short Courses for the Instruction and Inspiration of all Classes Engaged in Supervising and Constructing Highways.

18. Helping to Formulate and Pass Adequate Highway Legislation so that the State May Keep Pace with other States.

The Coming Battle

It may readily be seen from this hasty survey of some of the attendant problems that these changed highway conditions and this spirit of getting hitherto unheard of results have, instead of making our task easier, but served to tremendously increase our problems and responsibilities. We are on the threshold of a new epoch in highway construction in America, but instead of congratulating ourselves today that the long fight for highways is won, we should rather gird our loins for the impending battle. Added responsibilities bring added fears to the executive who thinks and spur him on to new efforts and new devices for developing himself and his organization to meet the new condition.

The coming battle is all the more serious because from time immemorial the American people, while always willing to pay the price for the work they desire, have never been willing to pay the price of the proper supervision of it. "Millions for public works, but a pittance for those who must design and supervise the building of them," seems to be the American spirit. Our national and state legislative halls are filled with men who appropriate millions and tens of millions with very little thought of the organizations necessary to properly expend them, and with much less desire to provide proper supervision than to further the prestige of themselves or of their political party.

Federal Policy

As a case in point: It was with the greatest difficulty that the present Congress could be induced to fix the salary of the very competent present head of the Federal Bureau of Roads at $6,000 a year, although this bureau will in the years 1919 to 1922, inclusive, supervise from the federal standpoint and protect the federal interest in the expenditure of probably $200,000,000 of federal money and with it the expenditure of $300,000,000 more from the states and local units. When a federal highway commission is proposed to be created to expend billions in the layout, construction, and maintenance of the proposed federal highway system, the salaries of the commissioners and of the chief engineers are fixed under protest, at $10,000 each per year, and we are told that Congress will never stand for these salaries and that they will probably be cut to much less before the bill becomes a law, if it should become a law. The National Congress is probably the most niggardly employer in America, unless some of the states bear off the unenviable palm. It seems hopeless to expect a continuously efficient organization in any federal bureau unless Congress shall see a new light and fix public salaries to fit the imposed responsibilities.

It is interesting, although disconcerting, to note the almost total lack of interest on the part of road promoting organizations in the fundamental problem of getting proper administrative bodies to control the highway programs. We have good roads associations, trail associations, highway councils, etc., ad infinitum, all seeking to promote the construction of roads in detail or in mass, and urging the nation, the states, and the counties to spend millions or billions on highways of all kinds, classes, sorts, and conditions.

The sole idea seems to be to get money and more money to build highways. It does not appear to matter to them what kind of highways, who builds them, or whether the people get a dollar's worth or a dime's worth for a dollar. Men are in these associations who make millions every year, who control organizations which are solely designed to get efficient dollar for dollar results, and who pay their executives what they are worth. Yet when they get into the field of public service they seemingly forget all the rules which made their own business a success, and expect a thousand dollar man to be the eighth wonder of the world and world beating organizations to grow over night with no possible financial encouragement. Unless business men of this class wake up and devote more thought to the basic problem of getting efficient organizations to spend the money, I fear a real disaster to our highway programs.

Politics and Salaries

All of us have probably in the past derided the possibility of getting effective results out of town and county highway efforts because (we said) politics had too great a part in road work in those units and that they would never pay the salaries necessary to get competent planning and supervision of the work. And yet in 34 of the 48 states which now have state highway departments, the governor may change the personnel of the state highway department so as to control it during his term of office. In many of these states the highway law is deliberately so framed that a new governor may make a clean sweep of the state highway department the minute he assumes office, if he so desires. In most cases he seems to have desired it. There have been at least 127 different executive highway officials in these 34 politically organized state highway departments in the grand total of 296 years of their existence, or a change every two and one-third years (on the average) in each state. The oldest executive officer in charge of highway work in any American state has served his state nine years in that capacity.

A state highway department is not right or it is not wrong just because it has a Republican or a Democrat at its head, or because one brand of Republican or Democrat is in control when another brand of the same political party comes into power. A state highway department is right when it is well organized to get efficient and economical results and is wrong when it is organized or unorganized to produce inefficient and uneconomical results.

Let us consider the salaries paid the executive officers of the state highway departments. There is one who is paid $20,000 per annum; two, $10,000; one, $8,000; two, $7,000; two, $6,000; and eight, $5,000; while 32 of them are paid less than $5,000 and 20 of them receive $3,600 or less. In this connection it should be remembered that the highway work expected to be supervised by a state highway department is now in few cases less than $3,000,000 a year and in many states it has reached, or will soon reach as much as fifteen, twenty, or twenty-five millions. What business organization in the world would pay on a similar scale for similar responsibilities or would expect to receive adequate results under such conditions?

I speak of these matters not in a spirit of fault finding but in order to interest you in the great problem of building up public opinion to the point where, for its own protection, it will insist upon the proper organization of every agency which deals with the expenditure of these great aggregations of highway funds.

Clean Cut Efficiency

We must, by every means in our power, by precept and example, preach the doctrine of clean-cut business efficiency in American highway administration. In doing so we will go up against the age long prejudice of the American people against paying their public servants a living or a proper wage. From top to bottom the scale of public salaries is wrong. The constitutional and other officers of the nation, of the states, of the counties, and of all other municipalities are, practically without exception, being paid, not on the basis of what their services are or should be worth, but on a basis fixed (in most cases long years ago) with due regard to the "honor" which must accrue to the holder of a public office. The universal custom was, is, and possibly always will be, to figure that the prospective holder of the job will be a politician with other interests or means and that the salary won't matter, or that joy at getting the "plum" of public office will dwarf all material considerations.

There is or should be an honor in being selected for public service—and worthy public servants appreciate and feel that honor. It may be, although I doubt it, worth while for the American people to consistently penalize those who work for them by paying them less than a living wage or less than the work would command if done for a corporation, or if done for the individual citizen in his private capacity. But the trouble with the system is that when the American people have before them a piece of really constructive work, like their present highway program, the policy falls down absolutely.

We must help the American people by making them realize that with hundreds of millions, even billions, to be expended in the next few years, the building of highways is a profession and a business and not a political football to be kicked around like the proverbial pup. This is not selfishness. Most of us are in this highway business because we love the work and because we want to help build up the states and the nation. I doubt if there is one man here who has made good or who is capable of making good who cannot leave his present state position and make more money working for himself or in employment in commercial lines. But the work must go on and it must go on well and we must feel an interest above a mere financial interest in the jobs we hold, if we are worthy of them. Money is not all—the satisfaction of creating, of building; of creating and building well; of helping to build a county, a state, or a nation, is worth more than a few hundred or a few thousand dollars a year if one can manage to live. We can't afford to pinch penies and bandy words just for ourselves; but in the interest of the competent and "up and coming" highway organization which must be created in every state to protect the interests of the people of the state, we can afford to fight for the right.

Unless there occurs a radical change in the American spirit of expecting much from their public servants and giving little, not one of us here will ever get rich or even attain a competence in the public service. We will, on the contrary, fight on and on until disgruntled politicians finally get us, or a younger and better qualified man supplants us. With the best of our youth, our enthusiasm, and our strength gone, we will retire full of wounds, without money, and without honors to make a new start in middle age. Such is the almost inevitable fate of the servants of the American people. But we can retire with honor unsullied and with our flags still flying. Later those who now fight the good fight for right standards and thus help make the path of their successors easy, may be recognized as public benefactors. When these pioneers are dead and buried, as is the custom here, they will be acclaimed as, after all, worth while and possibly even monuments will be erected to some of them.

I trust that nothing I have said in regard to state highway organizations will be wrongly construed. The present organizations, with very few exceptions, are, and have been doing effective work with limited opportunities. Where there is trouble it is in most cases due principally to the damnable political obsession of our American commonwealths. In too many states it is not even debated that the old political motto "To the victor belong the spoils" is the law and the gospel, and the idea that the victory of any political party or of a faction of any political party should not carry with it the transfer of all offices within the governor's control is not even considered, but a total overturn is taken as a matter of course. County and state officials without number have been thrown out of office for no other reason than that "They have held the job long enough, someone else should be given a chance." If a bank or a railroad, or any other corporation adopted the idea that political belief was the hall-mark of efficiency or that long continued service was a valid reason for discharging their personnel, public confidence would be lost, their stocks would be a drug on the market and the corporation itself would become bankrupt.

In fairness to my home state, Wisconsin, it should be stated that we have a non-political highway commission, the operations of which have been entirely free from political interference by the Governor or anyone else. I state this because there may be some idea that my remarks originate from dissatisfaction with conditions in my own state, which is not the case. Conditions, laws and public sentiment there are good and improving fast. I have, however, long been a student of American highway administration, have followed changing state laws and personnels, and have attended practically all national highway meetings for years. As a result of these observations I believe I can safely say that the great American highway problem will never be solved rightly until we get our state and county organizations safely established on the sole basis of well paid efficiency.

The American public must be convinced that if they will play politics with their public officials they should confine themselves to routine offices where almost anybody can get by because someone else does the work anyway. They must be convinced, on the other hand, that the highway departments of the states and of the counties come into a different class and that here merit and knowledge should be the sole criterion in selecting and keeping their officials, and that here at least, length of training and service is of tremendous value and a necessity if efficient and economical results are to be secured.

The professions of highway engineering and of highway building must be dignified so that they attract the best engineers and the best construction men in America. This is important not only for the immediate future, but especially for the years to come. Not only must we strive to attract and keep the best we have but we must get the coming men. We need all the brains and all the talent we can muster. To attract the best young men good working conditions, a clean atmosphere in public service, adequate compensation, and a reasonable chance of advancement must be offered. Less than this will not serve.

Therefore, let us dedicate ourselves to this work of helping to make all highway organizations efficient instruments, able and competent to carry out the American purpose of building a highway system befitting the greatness of the American nation. Than this, we can do the American people no greater service.

Progress on the Lincoln Highway

Accomplishments of the Past Year Reviewed in Yearly Report Sent Out by the Lincoln Highway Association—Expenditures Made, Mileages Improved and Types of Road Built

The actual improvement accomplished on the Lincoln Highway in 1919 was greater than that of any other year and "bid fair to equal the combined work of the previous five years," according to a special review of the year's work that has been issued recently by the Lincoln Highway Association.

The association has lately completed a compilation of the expenditures made on the Lincoln Highway by the states and counties it traverses and, because in many places the route has been included in the official state or county road system, "the tabulation of expenditures provided direct to the association by the state highway departments of the eleven states traversed very accurately indicates not only the amounts expended but the mileage of improvement accomplished." The results of this compilation are shown in Table I. In each case the amounts include not only the sums derived from state and federal funds that were accurately reported, but also such scattered county reports as were procurable.

TABLE I.—EXPENDITURES ON THE LINCOLN HIGHWAY IN 1919 FOR NEW CONSTRUCTION, RECONSTRUCTION AND MAINTENANCE.

New Jersey	$1,383,572.00
Pennsylvania	1,418,169.28
Ohio	1,903,708.10
Indiana	742,218.30
Illinois	1,430,120.28
Iowa	256,899.29
Nebraska	613,025.00
Wyoming	127,009.94
Utah	225,528.54
Nevada	411,049.58
California	375,500.00
Total	$8,886,800.31

The total shown in the table should be increased by about $500,000, according to the association's review, to cover county road work and city paving for which it was impossible to get accurate figures. This would bring the total of the year's expenditures to well over $9,000,000. It is also stated that contracts awarded but not completed will entail a further expenditure of $2,323,112.59.

The whole expenditure on the Lincoln Highway during the past six years is placed at $22,862,472.04, as is shown in Table II. The amounts given cover construction, reconstruction and maintenance.

During 1919, there were completed 377.33 mi. of what is designated by the association's review as "permanent improvement." The mileage of each type of road included in this total is shown in Table III. The total mileages of the various types of pavement and of the kinds of road built on the entire length of the Lincoln Highway up to Jan. 1, 1920, are shown in Table IV.

TABLE II.—YEARLY EXPENDITURES ON THE LINCOLN HIGHWAY

Year	Amount
1914	$1,200,000.00
1915	2,580,280.00
1916	4,198,165.00
1917	2,500,918.96
1918	2,996,307.77
1919	9,386,800.31
Total	$22,862,472.04

TABLE III.—MILEAGES OF VARIOUS TYPES OF ROAD BUILT ON THE LINCOLN HIGHWAY DURING 1919.

Type of road	Mileage
Concrete	121.14
Brick	21.28
Bituminous macadam	17.61
Macadam	28.75
Gravel	69.25
Shale	2.00
Permanent earth grade	117.30
Total	377.33

At the beginning of 1914, the Lincoln Highway route had a total length of 3,389 mi., of which 1,596 mi. had been improved. By the end of 1918, changes in the route had reduced the total length to 3,323 mi., while the improved mileage had been increased to 2,161 mi. At the beginning of the present year, the total mileage was 3,223 and the total mileage classed as improved had been increased to 2,538.

TABLE IV.—MILEAGES OF VARIOUS TYPES OF ROAD ON THE LINCOLN HIGHWAY, JAN. 1, 1920

Type of road	Mileage
Concrete	294.84
Brick	212.58
Bituminous macadam	425.61
Macadam	286.65
Asphalt	78.00
Creosoted Block	5.90
Granite block	7.10
Graded gravel	770.75
Natural gravel	200.00
Shale	17.00
Graded earth	817.57
Natural earth	93.70
Sand	13.30
Total	3,223.00

Purdue University Road School

Schedule of the Papers, Discussions and Demonstrations at the Sixth Annual Session, January 27, 28 and 29, 1920

The sixth annual session of the road school of Purdue University will be held at the University, Lafayette, Ind., on January 27, 28 and 29. A large attendance of county and city road and street officials and engineers and of road contractors is expected, the attendance in past years having ranged from 100 to 150.

The sessions will begin Tuesday afternoon, Jan. 27, that session being devoted to addresses of welcome and responses; an address on the Indiana State Highway Commission by Director L. H. Wright; "State Highway Construction," by H. K. Bishop, Chief Engineer of the Indiana State Highway Commission, and an address on "Hauling Highway Materials," by a speaker to be selected.

Papers and addresses at the sessions on Tuesday evening, Wednesday morning and afternoon and Thursday morning include the following:

"Asphaltic Macadam and Asphaltic Concrete Pavements," Arthur H. Blanchard, Professor of Highway Engineering, University of Michigan; "Federal Aid in Indiana," R. E. Toms, Senior Highway Engineer, Bureau of Public Roads, U. S. Department of Agriculture; "Highway Lessons of the World War," George E. Martin, Associate Professor of Highway Engineering, Purdue University; "Construction and Maintenance of Bituminous Macadam Roads," Walter Buehler, of the Barrett Co.; "Gravel Roads," T. R. Agg, Professor of Highway Engineering, Iowa State College; "The Jog in the Road,' discussion led by E. C. Minton, County Surveyor of Tippecanoe County, Indiana; "The Development of Concrete Roads," C. D. Franks, District Engineer, Portland Cement Association; "The Real Issue in our Highway Problem," H. E. Bilger, Consulting Engineer, Monmouth Stone Co.; "Highway Bridges," Wm. J. Titus, Bridge Engineer, Indiana State Highway Commission; "The Relation of the Bonding Company to Highway Work," discussion by representatives of the Lion Bonding & Surety Co.; "The Work of the U. S. Weather Bureau in Reporting Road Conditions," J. H. Armington, U. S. Weather Bureau; "State Road Maintenance," A. H. Hinkle, Chief Maintenance Engineer, Indiana State Highway Commission; "The Development of Brick Roads," Clark R. Mandigo, Consulting Engineer, Western Paving Brick Manufacturers' Association; "The Administration of the Highway Laws," by representatives of the State Board of Accounts.

At the opening of the session on Wednesday forenoon there will be a demonstration of road material testing conducted by R. B. Crepps, Instructor, Purdue University.

The annual meetings of the County Surveyors' Association, the County Highway Superintendents' Association and the Highway Contractors' Association will be held on Wednesday evening.

The formal papers and addresses will be followed by open discussions and moving pictures will be used to illustrate some of the topics considered.

Rates on Road Building Material

Ruling on Reduced Rates on Road Building Materials Extended to February 29, 1920

The following circular was issued on Dec. 29, 1919, by the Division of Traffic of the United States Railroad Administration:

"To Carriers under Federal Control:

"The date of expiration of Division of Traffic Circular No. 9 of April 14, 1919 (quoted below), is hereby extended to and including February 29, 1920.

" 'This will authorize all railroads under Federal control to apply rates as shown below on carload shipments of stone (broken, crushed, and ground), slag, shells, chatts, chert, sand, and gravel shipped during the period from May 1 to December 31, 1919, inclusive, when for use in road building or road maintenance, and when consigned to and the freight thereon is paid by Federal, State, County, Parish, Township, or Municipal Government.

" 'The reduced rates to be applied on such material shall be 10 cents per net ton less than the regularly published tariff rates in effect for the transportation of these materials for commercial uses at the time shipments move; but with a minimum charge of 40 cents per net ton, except that where the regularly published commercial rate is less than 40 cents per net ton, then such regularly published rate shall apply.

" 'The reduced rates may be applied on shipments consigned as outlined above, but in care of a contractor, provided the freight is paid by the Government, and provided proper certification is made by the Government through its properly accredited representative that the shipments are for the use of and the reduction in the rate will accrue to the Government.

" 'The rates authorized by this circular are to be applied without publication in tariffs, account Government property, but each railroad hauling such material is charged with the duty of seeing that the reduced rates are applied only on bona fide Government material where the freight charges saved by the reduction will accrue to the Government as indicated above.' "

The State of North Dakota will have between 500 and 600 mi. of federal aid work under contract early in 1920, according to a recent report. Preliminary surveys are now being made and it is estimated that the cost of the work will be from $1,500,000 to $2,000,000.

Hearses and Other Motor Vehicles Used for Funerals are not held to be commercial vehicles under the Pennsylvania motor vehicle law, according to a recent announcement made by B. G. Eynon, Registrar of the Automobile Division of the State Highway Department. Applications for registering such vehicles should, therefore, be made on the forms used for registering passenger cars.

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

Founded January, 1892

E. L. POWERS
Editor

T. A. HULBERT
Managing Editor

150 NASSAU STREET
NEW YORK, N. Y.

Cable Address: Gudrodes, New York

Copy for advertisements must reach the New York office by noon on Tuesday of the week before date of issue if proofs are to be submitted.

Copy for classified and other advertisements where proofs are not required will be accepted until noon on Monday of the week of issue.

Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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Vol. XVIV JANUARY 7, 1920 No. 1

THE MOTORIST'S SHARE OF ROAD IMPROVEMENT COSTS

How large a part of the cost of road betterment should be assessed upon the owners of automobiles and motor trucks has always been a vexatious question. And it probably always will be.

It has been the subject of many convention papers and addresses and of many magazine articles, and it has been discussed at practically every gathering of highway engineers and officials. A paper in which it is treated very fully and very helpfully is printed on other pages of this issue.

Theoretically, the solution of the problem is very simple: The cost of road construction and maintenance should be distributed in direct proportion to the benefits accruing. But the practical application of that principle is difficult in the extreme—in fact, practically impossible.

While the owner of a passenger car or a truck is a direct beneficiary of good roads, his use of them is usually of benefit to others also. In the case of a truck, for instance, the benefit extends in large measure to the producers and the consumers of the commodities carried. A similar line of reasoning could be followed in almost every case of the use of the highways by a motor vehicle. Therefore, it obviously would not be equitable to compel the owners of such vehicles to bear the entire cost of providing roads for the traffic.

Again, as Mr. Bradt points out in the paper to which reference has been made, the man who drives a light car a thousand miles in a year should not, as at present, have to pay the same fee as the man who drives the same kind of car twenty thousand miles annually. This is not an equitable distribution of cost. Nor is it just to charge a higher fee for a heavy car than for a light car when the heavy machine is driven only a few hundred miles in a season in which the lighter car is driven thousands of miles.

The fees for driving motor vehicles over the country's roads will not be properly adjusted until they are made proportionate to the wear of the roads caused by the vehicles upon which they are levied. This means that they must be based not alone upon horse power or weight, but upon speed, mileage, size and character of tires, and all other factors that have a bearing.

But the adjustment of automobile and truck fees is only a part of the problem. After the adjustments referred to are made there will remain the apportionment of the cost of road betterment to those who do not own motor vehicles but who are directly or indirectly benefited by the use of those vehicles.

The problem is one whose magnitude is better and better appreciated as it is studied. It is a really pressing one and calls for immediate and careful attention.

"THE AMERICAN HIGHWAY PROBLEM"

Under the above title appears elsewhere in this issue an article that we wish could be read by every voter. It is the presidential address by A. R. Hirst, State Highway Enginer of Wisconsin, before the American Association of State Highway Officials at its recent annual meeting, and it contains a multitude of truths that ought to be realized by the American public.

Lack of space makes it impossible to dwell at any length on any of the facts recited by Mr. Hirst or to even call attention to all of the points we would like to emphasize, but we cannot forbear to touch briefly upon some of the outstanding facts he cited.

What Mr. Hirst designates as the first problem, that of trained engineering assistants, is of undoubted gravity. As he contends, there is a great lack of such men in the highway field. But we have always inclined to the belief that the scarcity was less due to any real dearth of properly trained men than to the conditions of salary and tenure of office that exist in the highway field and that operate to discourage the good men who might otherwise be attracted to road building as a life work. That is a matter that will be touched upon later.

The problem of cement is another in reference to which we do not find ourselves in complete accord with the author. While we are convinced that most of his arguments are sound, we doubt very much if by any means all able engineers will agree that "much, if not all, of the so-called permanent surfacing will be either cement concrete or other surfacings on a cement concrete base." It will be readily granted that the all-concrete pavement has a place in road building and that cement concrete foundations will be required under many pavements. But, as has only recently been pointed out in this column, foundations of other types will answer every purpose in many cases and in some will possess very decided advantages.

In his discussion of the matter of car service, Mr. Hirst ably expressed the views of many of his fellow workers in the road building field. In like manner, he spoke for a great many highway engineers and officials in his treatment of the problem of efficient construction organizations and fair prices and of the problem of labor.

The problem of improved location and alignment should have especially careful study. Mr. Hirst made the same plea that has been made time and again in this column and in articles printed elsewhere in this journal—that regard be had for the purpose of the road. Not until roads are built as parts of a transportation plant, will they really perform their true functions. The end to which the road builder works is the providing of transportation facilities, not the making of mere roads.

After discussing at some length the problems that have been mentioned and listing a number of other important ones that are demanding solution, Mr. Hirst passed to the subjects of engineers' salaries and the evils of political administration of road work. This portion of the address is particularly pertinent at the present. The inadequacy of the remuneration of road builders has frequently been deplored in this column and, as has already been pointed out, it is believed to be the chief cause of the lack of properly trained men in the road building field. Not until engineers in public service are paid salaries commensurate with those paid by private business enterprises will any considerable number of high grade men be attracted to that field of endeavor. And not until the administration of road work is freed from partisan politics will the work be done with the maximum attainable efficiency and with the greatest economy possible.

Road in Mexican Oil Fields

Work Commenced on a Modern Road Through Oil Fields of Gulf Coast Region of Mexico

The building of the first modern highway through the oil fields of the Gulf coast region of Mexico has recently been commenced. The work is being done by various oil companies and other interests, with assistance from city and state governments.

The roadway will be of shell and asphalt and the work will include the construction of bridges to carry heavy traffic. The construction will be carried out under the supervision of engineers of the Mexican Gulf Oil Co., and it is expected that the road will be open to traffic by June.

The construction of the road will provide a direct route from Tampico to Panuco, Ebano, Valles and San Luis Potosi.

Pennsylvania Highway Department Field Forces Reorganized

Engineers Transferred and Promoted—Number of Districts Increased from 15 to 18

The Pennsylvania State Highway Department has recently announced a reorganization of its field forces, effective Jan. 1. Several district engineers have been relieved and assigned to other duties and the number of districts has been increased from 15 to 18. New districts engineers have been secured by promotions from lower grades.

The district engineers relieved are C. W. Hardt, formerly in charge of District No. 2; Arthur S. Clay of District No. 3; H. W. Claybaugh, of District No. 4; W. F. Cressman, of District No. 7; W. O. Bennett, of District No. 8; and H. W. Bircher, of District No. 12. Messrs. Clay, Claybaugh, Hardt and Cressman have been transferred to the Township Division of the Department and Mr. Bennett has been made superintendent of McKean County.

W. R. Wolfinger, for some time district engineer at Allentown, has been promoted to assistant construction engineer in the head office at Harrisburg.

The districts and district engineers under the reorganization are as follows:

District No. 1, Clinton, Center and Clearfield Counties, D. C. Stackpole, Bellfonte; No. 2, Dauphin, Lebanon and Lancaster, C. W. Erisman, Harrisburg; No. 3, Columbia, Snyder, Montour, Northumberland, Union and Sullivan,, H. G. Harper, Bloomsburg; No. 4, Venango, Mercer, Lawrence and Butler, C. H. Buckius, Franklin; No. 5, Northampton, Lehigh, Berks and Bucks, C. E. H. Smith, Allentown; No. 6, York, Adams and Fraklin, George W. Crawford, York; No. 7, Delaware, Montgomery and Chester, Maj. C. E. Myers, Philadelphia; No. 8, Jefferson, Indiana, Clarion and Armstrong, Paul Brubaker, DuBois; No. 9, Cumberland, Perry, Juniata and Mifflin, Capt. George P. Searight, Harrisburg; No. 10, Bradford, Tioga and Lycoming, Capt. J. S. Ritchey, Wellsboro; No. 11, Cambria, Blair and Huntingdon, Charles S. Lemon, Hollidaysburg; No. 12, Susquehanna, Wayne, Lackawanna, Pike and Monroe, S. P. Longstreet, Scranton; No. 13, Beaver, Allegheny and Westmoreland, W. D. Meyers, Pittsburgh; No. 14, Washington, Green and Fayette, Charles Fitzsimmons, Washington; No. 15, Warren, Forest, Erie and Crawford, Capt. F. E. Winter, Warren; No. 16, McKean, Potter, Elk and Cameron, M. A. Lynch, Smethport; No. 17, Wyoming, Carbon, Schuylkill and Luzerne, H. R. Moffitt, Wilkes-Barre; No. 18, Somerset, Bedford and Fulton, A. K. VanIngen, Bedford.

Messrs. Stackpole, Erisman, C. E. Myers, Searight, Ritchey, W. D. Meyers, Winter and Moffit have for some time been district engineers with the State Highway Department. H. G. Harper has been resident engineer in District No. 15; C. H. Buckius assistant engineer in District No. 1; C. E. H. Smith assistant district engineer in District No. 5; George W. Crawford assistant engineer in District No. 6; Paul Brubaker assistant district engineer in District No. 8; Charles S. Lemon an engineer in the Township Division; S. P. Longstreet assistant engineer in District No. 15; Charles Fitzsimmons assistant engineer in District No. 13; M. A. Lynch inspector in District No. 3, and A. K. VanIngen resident engineer in District No. 11.

The title of all new men in charge of districts is "acting district engineer."

Hudson River Vehicle Tunnel Contract Signed

Tunnel Commissions of New York and New Jersey Sign Contract for Construction, Maintenance and Operation of Proposed Tube for use of Vehicles and Pedestrains

A contract for the building of the vehicle tunnel under the Hudson River between the Borough of Manhattan, New York City, and Jersey City, N. J., has been signed by the Tunnel Commissions of the two states.

The step was taken under the provisions of a law passed at the last session of the New York Legislature, which required the preparation of a contract for the joint construction of the tunnel by the two states. The new York Commission drew up the contract and submitted it to the New Jersey Commission last May.

The contract provides that the states shall jointly construct, repair, maintain and operate the tunnel, subject to appropriations by the two legislatures. The tunnel is to be for vehicles and pedestrians only, and no franchise for the operation of surface or subway lines through it can be granted except with the approval of the governors and legislatures of the two states.

Each legislature appropriated $1,000,000 at the last session. It is estimated that the tunnel will cost $12,000,000.

The states have agreed to establish a schedule of tolls that will bring sufficient revenue to repay each of the states the principal, and interest, of the cost advanced for construction within 20 years.

HIGHWAY TRANSPORTATION

What Part of the Total Cost of Highway Construction and Maintenance should the Motor Vehicle be Expected to Bear?*

By S. E. BRADT†

The question propounded in the topic assigned to me is one calling for the judgment of each individual; and his answer will be governed to a certain extent by conditions existing in his own state. Therefore, what I shall say may not exactly apply to all states, but will serve, nevertheless, as a basis for discussion.

The providing of funds for governmental expenditure has been a problem in all ages. Every great emergency, such as the prosecution of war by a nation, and every great necessity, involving large expenditure and calling for largely increased taxation, has brought about new methods of providing funds. The underlying principle of taxation is that the taxes shall be levied as far as possible in proportion to the benefits received. Its practical application, however, involves levying the taxes upon those who have the money with which to pay. This is illustrated very forcibly by the revenue measures passed by Congress to meet war expenditures. Again, in levying taxes for highway improvement it must be done in a manner that will meet the approval of those who are to pay the taxes,for the reason that any extraordinary expenditure has to be approved by the people at the polls. The more nearly these three factors, namely, levying the taxes according to benefits received, upon the people who have the money, and with the approval of those who pay, can be merged into the plan of taxation, the more equitable and the more successful the plan will be.

We naturally come back to the oft discussed question as to who receives the benefits from road improvement. That there is a general public benefit to our entire citizenship, applying equally to those who do not use the roads as well as to those who do, is beyond question. We are well aware of the fact that cheaper distribution by reason of good roads will mean cheaper farm products for all the people; the more readily accessible schools and churches and places of amusement will bring about a general betterment of society; that the free movement of fresh foods to the centers of population will bring better health to the communities; that better roads bring better farm conditions and more intelligent farming, which will mean increased production.

In addition to the general indirect benefits to all the people above referred to, there are direct and pecuniary benefits accruing to the users of the road. These, as you well know arise from a saving of time to the car owner, a saving in wear of tires, a saving in repairs and in gasoline consumption, as well as from the added life of the car itself.

What these direct benefits to each car owner will average anually is a question over which there may be considerable difference of opinion. I think I am safe in saying, however, that there are very few people who will not place these benefits greatly in excess of the license fees charged at the present time by any of the states. So long as these fees do not exceed these direct benefits the tax is just and the motorist is not being harmed.

The motor license fees in Illinois averaged approximately $5 per car in 1917. In 1918 the fees were increased to an average of about $7 per car and in 1920 the fees will average $10 per car. This fee will produce about $5,000,000 in 1920, which has already been appropriated as follows: for maintenance, $200,000.00; and the remainder to be expended on federal aid roads in connection with federal money. This, however, is not all that is provided for road work in Illinois. During the same period there will be raised by general taxation through county and township levies about $15,000,000 or three times the amount received from motor license fees. In other words, the motorist because of the direct benefits he receives will be called upon to pay $5,000,000, while the general public, including motorists, will pay $15,000,000 because of these direct benefits. I do not believe this represents the correct ratio between the direct and indirect bnefits of road improvement, and am of the opinion that there is considerable room for further increase in motor fees before we reach the right proportion. The above increases, however, serve to show the evolution in legislation and the change in public sentiment towards levying a larger tax on the motor vehicle.

Let us come back to the two practical factors in the problem of taxation mentioned above, namely, getting the money from the people who have it and getting it with their consent. The motorist not only has the small amount of money with which to pay his annual motor license fee, but is willing, even anxious, to approve any reasonable license fee that will bring about highway improvement. More than this, he is willing to pledge the payment of these fees over a long period of years as a basis for the payment of bond issues to be used for highway improvement. As evidence of this I would call attention to the fact that in Illinois the voters approved a $60,000,000 bond issue for highway improvement by a vote of 661,815 to 154,396; with the provision that the bonds and interest would be paid entirely from the motor license fees, which required a 100% increase in those fees. Approximately one-third of the voters were motorists, and the most enthusiastic supporters of the proposition throughout the state were these motorists. I do not think that the people of Illinois differ very materially from the people of other states in their attitude towards questions of this kind. Therefore, what can be done in Illinois can be done anywhere.

For this reason I do not hesitate to say that if motorists can be assured that the money is to be properly expended they stand ready to give their approval to any reasonable, direct tax on motor vehicles for highway improvement.

I said in opening this discussion that a great public necessity which requires an unusually large expenditure often calls for a change in our method of taxation. Undoubtedly the license fees were inauguarated because of the excessive damage to the existing macadam roads by automobile traffic. The increased motor traffic made it apparent that these roads not only must be maintained, but that thousands of miles of additional roads must be surfaced. The amount of money required today to improve sufficient roads to meet the demands of public sentiment throughout the United States runs into billions of dollars. To add the amount thus required to the present heavy general taxation would undoubtedly result in failure in many of the states; but if the motorist is willing to assume a reasonable proportion of this cost through motor license fees, to go direct to road improvement or to the payment of bonds for road improvement, I

(Continued on page 12)

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*Paper presented at the 5th annual meeting of the American Association of State Highway Officials, Louisville, Ky., Dec. 8-11, 1919.

†Superintendent of Highways, Division of Highways, Illinois Department of Public Works and Buildings.

EQUIPMENT—TRADE—MATERIALS

New Wagon Loader

A new labor saving machine recently put on the market is shown in the accompanying illustration. It is a self-feeding wagon loader, designed especially for the use of road contractors and others handling broken stone and similar materials.

The machine consists, essentially, of a bucket elevator, a power plant and the feeding device, all mounted on a 4-wheeled truck with traction equipment. The frame is of structural steel shapes, fitted with 42x6-in. rear wheels and 27x4-in. front wheels. The power plant, which is mounted on the forward part of the frame, consists of a 4-cylinder gasoline engine, rated at 22 hp. If electric power is preferred, a 15-hp. A. C. or D. C. electric motor is furnished. The loader has a traveling speed of 140 ft. per minute forward and 70 ft. per minute backward. Its operating speed is 70 ft. per minute forward and 28 ft. per minute backing into the material pile while loading. The rear axle is fitted with a differential, permitting the machine to be turned around in its own length.

The elevator chain carries 18x8x6½-in. buckets, spaced 20 in. apart. Height of discharge can be adjusted at 8 ft. or at 9 ft. 6 in.

A special feature of the machine is the self-feeding device. This consists primarily of two shovel-shaped arms that revolve, digging into the pile and bringing the material within reach of the buckets. These arms clear a path wide enough to permit the machine to back into the pile or to pass entirely through it.

Under correct working conditions, the loader has a capacity of 1⅝ cu. yd. per minute. It weighs 8,300 lb. The operation of the machine is controlled from a platform at the side, through friction clutches.

The machine is known as the Austin self-feeding wagon loader, and is manufactured by the F. C. Austin Co., Inc., of Chicago, Ill.

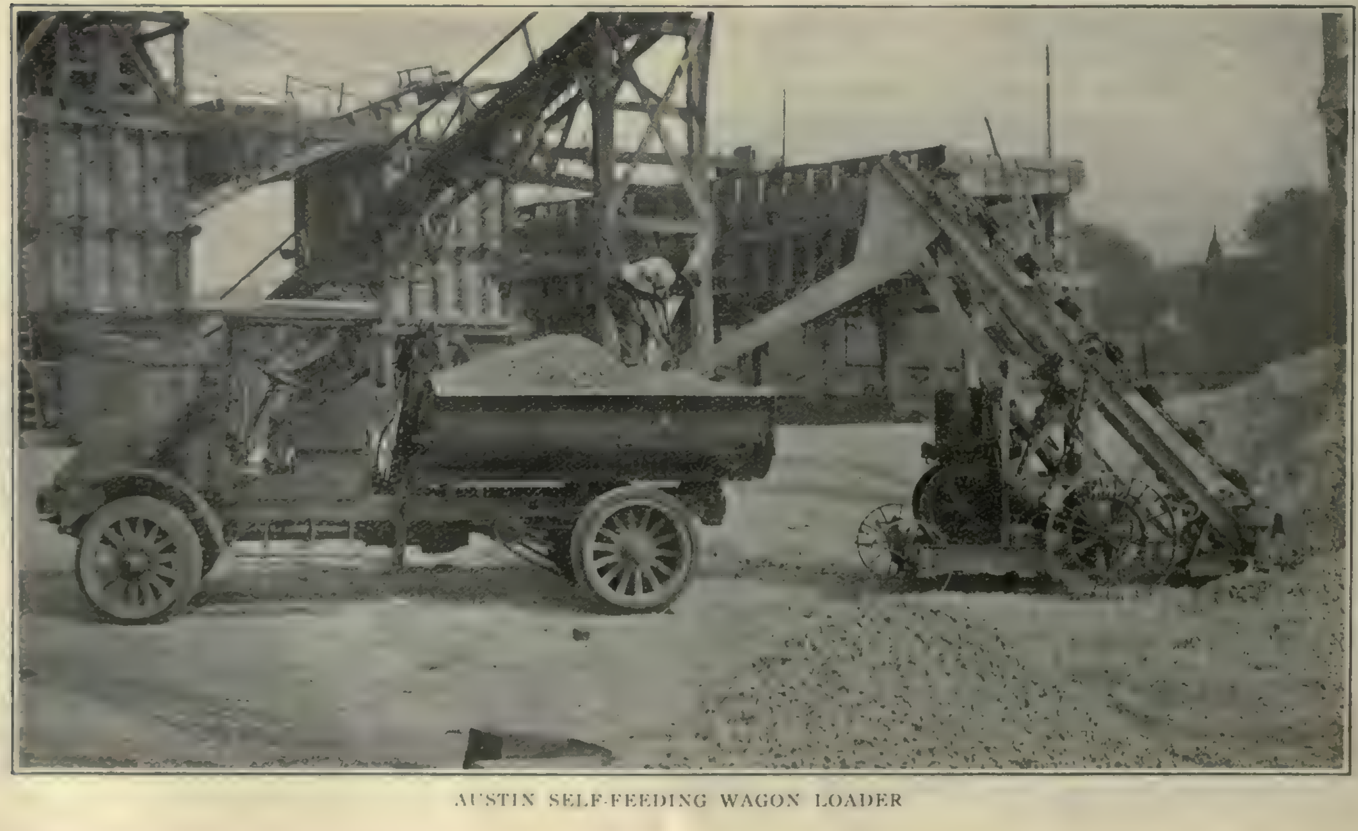
Sinclair Refining Company Creates Asphalt Sales Department

The Sinclair Refining Co. has announced the creation of an asphalt sales department to handle the output of its refinery at Meraux, La., which was formerly operated by the Freeport & Mexican Fuel Oil Corp.

This plant is to be devoted exclusively to the production of refined asphalt from selected heavy maltha from the Panuco field in Mexico. The company plans to produce a complete line of asphalts for all purposes. Through affiliated companies it controls its own fields in Mexico as well as ample steamship facilities for the transportation of the raw material to the Meraux refinery. It also owns a large number of especially equipped tank cars and is rapidly increasing the number.

The headquarters of the new department will be in the Conway Building, Chicago, Ill. E. F. Fitzpatrick has been appointed manager and J. M. Woodruff has been made assistant manager.

The International Motor Co., of New York, manufacturers of Mack Trucks announces the opening of another branch at No. 2309 Chester Ave., Cleveland, Ohio. The new branch will be in charge of I. C. Moller and will do business under the name of the International Mack Corp. It supersedes the Malin Motor Co., the former Mack dealers in that territory.



AUSTIN SELF-FEEDING WAGON LOADER

MEETINGS

Calendar of Coming Meetings

Jan. 15-16.—Southern Appalachian Good Roads Association.—Tenth Annual Meeting, Asheville, N. C. President, A. D. Williams, Parkersburg, W. Va.

Jan. 21-23—Associated General Contractors of America—Annual Meeting, Chicago, Ill. Secretary, 111 West Washington St., Chicago, Ill.

Jan. 29—National Highway Traffic Association—Annual Convention, International Amphitheater, Chicago, Ill. President, Arthur H. Blanchard, University of Michigan, Ann Arbor, Mich.

Feb. 9-13—American Road Builders' Association—Seventeenth Annual Convention, Tenth American Good Roads Congress and Eleventh Good Roads Show under the auspices of the A. R. B. A., 1st Regiment Armory, Louisville, Ky. Secretary, E. L. Powers, 150 Nassau St., New York, N. Y.

Apr. 12-17—United States Good Roads Association—Eighth Annual Convention, Hot Springs, Ark. Director General, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

Apr. 16-17—Bankhead National Highway Association—Fourth Annual Convention, Hot Springs, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

Associated General Contractors

The annual meeting of the Associated General Contractors of America and affiliated organizations will be held at Chicago, Ill., on January 21, 22 and 23. In connection with the business sessions of the organization, there will be held a two-day conference on construction problems which will be open to all general contractors whether members of the association or not.

The meetings on the second day of this conference will be held by groups, one of which will comprise highway contractors.

Officers for 1920 have been nominated as follows. President, Frederick L. Cranford, President, Frederick L. Cranford, Inc., New York, N. Y.; First Vice President, T. T. Flagler, President, the Flagler Co., Atlanta, Ga.; Second Vice President, J. W. Cowper, the John W. Cowper Co., Buffalo, N. Y.; Third Vice President, W. O. Winston, President, Winston Bros. Co., Minneapolis, Minn.; Treasurer, C. F. Mullen, Secretary and Treasurer, the Masters & Mullen Construction Co., Cleveland, Ohio.

PUBLICATIONS

MOTOR TRANSPORT CORPS, Report of the Chief, to the Secretary of War, for the fiscal year ending June 30, 1919. Paper, 5¾x9 in., 39 pages and covers.

This includes a brief but comprehensive report of the organization and development of the Motor Transport Corps, followed by several appendices covering details. Among the latter are a list of the kinds of cars purchased by the army, organization tables, etc.

BRITISH ROAD BOARD, ninth annual report, for the fiscal year ending March 31, 1919. Paper, 8¼x13 in., 64 pages.

This report is similar in arrangement and contents to previous reports of the Road Board. It consists of a few pages summarizing the Board's operations followed by 13 appendices covering various phases of the work. Many of them are tables showing expenditures and work done. One of the most exhaustive comprises the report of the Road Board upon the proposed highways in the dock and lower Thames-Side area recommended by the London Arterial Roads Conferences.

"HIGHWAY INSPECTORS' HANDBOOK," by Prevost Hubbard. Flexible binding, 4½x7 in., 372 pages, illustrated. John Wiley & Sons, New York, N. Y. $2.50.

This book is for the field use of inspectors, engineers and contractors, and was prepared by Mr. Prevost Hubbard, Chemical Engineer, The Asphalt Association, formerly Chief, Division of Road Material Tests and Research, Bureau of Public Roads, U. S. Department of Agriculture. It contains 19 chapters, each dealing with a special subject.

PERSONAL MENTION

A. T. Smith, who recently returned from service overseas, has been appointed road engineer of Pike County, Kentucky.

Merritt Drain, Road Engineer of Jefferson County, Ky., has been elected president of the State Highway Engineers' Association.

Frank E. Cave has resigned from his position with the St. Paul Union Depot Co., to enter the bridge department of the South Dakota State Highway Commission.

Frederick D. Woodruff, of the New Jersey State Highway Commission, has been appointed instructor of surveying in a new class organized at the Trenton School of Industrial Art.

C. S. Cheney, Secretary of the City Plan Commission of California and City Planning Consultant of Portland, Ore., has been appointed city planning engineer of the City of Spokane, Wash.

H. W. Houghton has been employed by the Nebraska State Highway Department as a designer. Mr. Houghton was formerly in the engineering department of the Kansas City Southern R. R.

E. F. Fitzpatrick has been appointed manager of the asphalt sales department recently created by the Sinclair Refining Co., Chicago, Ill. Mr. Fitzpatrick has had wide experience in the asphalt and petroleum industry, both in this country and in Mexico. He has been identified with the Sinclair Company for about a year and a half

Harvey S. Owen has resigned as western district engineer of the Lime Association to become chief engineer of the Glencoe Lime & Cement Co., of St. Louis, Mo. Mr. Owen is a graduate of the Missouri School of Mines and was at one time state chemist of Missouri. From 1910 to 1917 he was a construction engineer with the St. Louis Board of Public Works. In 1917 he joined the staff of the Portland Cement Association and in January of this year entered the employ of the Lime Association.

J. M. Woodruff has been appointed assistant manager of the newly organized asphalt sales department of the Sinclair Refining Co., of Chicago, Ill. He was formerly manager of the paving and publicity departments of the Standard Asphalt & Refining Co. Mr. Woodruff has been identified with the marketing and use of asphalt in pavement work in the central and southern states for the past ten years. He assisted in the formation of the Southern Asphalt Association, resigning as general manager of that organization to accept his present position.

George I. Howard, who served for many years as deputy city engineer of Schenectady, N. Y., has been appointed city engineer.

W. F. B. Haynsworth has resigned as city engineer of Greenville, S. C., to become assistant commissioner of public works of Winston-Salem, N. C.

C. W. Anderson has been apointed district engineer of the Minnesota State Highway Department for Logan County, succeeding D. W. Webster, whose appointment as division engineer was noted in "Good Roads" of Nov. 26.

OBITUARY

Charles Keith Blackwood, Vice President, Assistant Treasurer and a director of the Sullivan Machinery Co., died on Dec. 14. Mr. Blackwood had been an important member of the company for the past seventeen years

Joseph H. Weeks, President of the Keystone Automobile Club, died recently at Philadelphia, Penn. Mr. Weeks was the author of what is known as the Sproul Good Roads Act, a director of the Pennsylvania Motor Association and chairman of the good roads committee.

Cornelius Kennedy, a street paving contractor of Parkersburg, W. Va., died recently at his home in that city. He entered the paving business in the early 80's and laid the first brick pavements in a number of cities in West Virginia, Ohio and western Maryland. Until a few months before his death he was active as the senior member of the firm of C. Kennedy & Son. Recently, however, he disposed of his interests to the Kennedy Construction Co., of which his son, John R. Kennedy, is president and general manager.

What Part of the Total Cost of Highway Construction and Maintenance should the Motor Vehicle be Expected to Bear?*

(Concluded from page 9)

believe the money can be provided as rapidly as the country can find labor, materials and transportation to carry on the work. The placing of a reasonable proportion of the cost of construction and maintenance of our highways upon the motorist is not only equitable but will make the task of raising the money comparatively easy.

There has been much dicsussion over the question of whether "motor license fees should be used for construction," some people holding to the view that this fund was intended for maintenance only and should be confined to that single purpose. In Illinois a dollar looks just the same whether derived from general taxation or from motor license fees; and whether it should be used for one purpose or the other, or both, is a matter to be determined by local conditions. Maintenance is absolutely essential, and if a state requires for maintenance of its roads the entire amount derived from motor license fees it is perfectly proper to devote it entirely to that end. If it requires only a part of the fees for maintenance then why not devote the remainder to construction? Our policy should be to charge a reasonable fee somewhat in proportion to the direct benefit received and then use the money to the best advantage and where it will do the most good.

There is another phase of the problem of taxing motor vehicles; that is, that it will ultimately reach a very large percentage of the tax-paying population. Several of the states at the present time have an average of one vehicle to every 6 or 8 of the population. Illinois at the present time has one car to about every 12 people; but the present increase indicates that by 1923 we shall have one car to every 8 people. This means an average of nearly one car to a family. Therefore, while the motor license fee taxation will not be uniform as to the valuation of property, it will be fairly equivalent to a general taxation on the basis of the population.

Before closing I wish to say that it is generally recognized that horse power rating as a basis of motor license fees is not equitable. The man who drives his Ford car 1,000 mi. in a year pays the same fee as the man who drives the same car 20,000 mi. in the same length of time. The man driving the 1,000 mi. should undoubtedly pay more in proportion to the mileage travelled than the man driving the 20,000 mi. but his total annual tax should not be the same.

We are all waiting for some ingenious individual to work out a more equitable plan, such as a graduated gasoline tax by which each vehicle would pay a fee in proportion to its weight and the mileage driven; that is, in proportion to its actual use of the road.

In conclusion, the demand which we are now facing for highway improvement, calling for a volume of money never before dreamed of in any scheme of internal improvement, places us in a position where we shall be obliged not only to use the old established methods of raising money, but to resort to any other equitable plan which may be devised. The raising of funds for this work by a license fee to be paid by the individual who uses these highways and receives a large direct benefit from this improvement, is surely an equitable and proper source of revenue, and the benefit is so pronounced that the motorist stands ready to offer this assistance.

As has been indicated the proportion which the motorist should pay towards highway improvement and maintenance will differ in almost every instance because of varying conditions. The proportion will to a large extent be determined by the license fees charged. If fees are based on benefits to the motorist, it is apparent that the greater the mileage improved or maintained, the greater the benefits, that is, the broader the scale of your plans the larger should be your license fees.

These matters are for local determination in accordance with local conditions and local public sentiment.

Good Roads Aid Fire Protection

Farmers of Genesee County, New York. Plan Operation of Rural Fire Truck in Section Within 10 Miles of the City of Batavia

One of the most recent developments in the growing use of the country's highways is reported from Genesee County, New York, where the farmers near the City of Batavia are planning the installation of a rural fire truck.

According to recent advices, farmers living within 10 mi. of the city have organized the County Rural Fire Truck Association to purchase and operate a fire truck equipped with a pump and three 40-gal. chemical tanks. The truck will be kept in Batavia and will be called to fires in the territory covered by the association in the same manner as city apparatus is called. The cost is to be met by assessing each member of the association at the rate of $1 for each $1,000 of the value of his buildings. Any non-member calling the truck will be charged a fee of $50 for the assistance rendered.

GOOD ROADS

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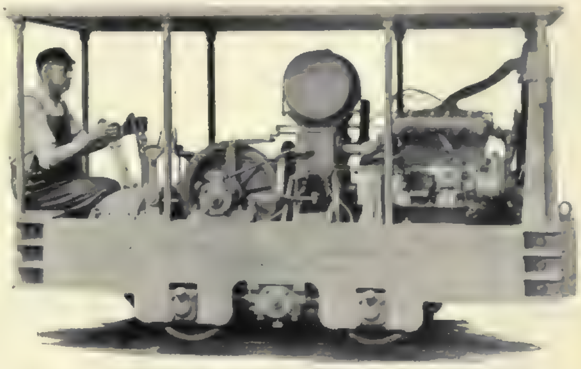

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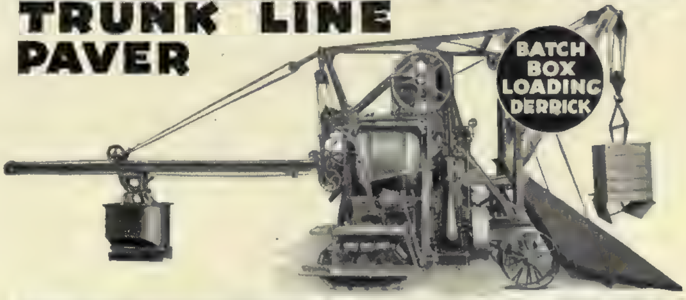

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GOOD ROADS
CONSTRUCTION TRANSPORTATION MAINTENANCE
WITH WHICH IS INCORPORATED
THE HIGHWAY CONTRACTOR AND ROAD BUILDER

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NEW YORK, JANUARY 14, 1920
Number 2

The Present System of Federal Control and Aid for Highways; Its Results, Merits and Limitations[*]

By THOMAS H. MACDONALD[†]

A careful definition of the problem set up by this topic is essential to its discussion, and such a definition rests entirely upon a careful scrutiny and analysis of the uses which we are now making, and which we will in the future, of our highways.

These uses may be defined roughly in four general classes. First, those uses chiefly related to agriculture; second, those which are recreational in character; third, those which are commercial; and fourth, those which are military. It is believed that these uses are placed in the order of their importance as determined by their respective volumes, considering traffic in the aggregate for all of the forty-eight states. Admittedly, there are sections, perhaps of some considerable area, in which the ranking order of these classes would be changed, but conceding this it does not modify the principle that the roads which we are building must serve these four classes of traffic, and that a failure to provide adequately for any one of these classes means a shortcoming, at least in the methods adopted by both the states and the nation; so those laws which we now have must be judged in the light of the degree to which we are now providing, or, if given sufficient time, will provide, for these classes of traffic; and certainly provision for these classes is the whole object of the enactment of either state or national highway laws, or the establishment of state or federal highway departments. This statement should be reiterated until the attention of road builders is focused upon the proper objective. It sometimes would seem that we are likely to lose sight of the object we are attempting to obtain in discussing the manner or the means through which we shall operate, and at such times it seems highly desirable to analyze in some detail the uses of the roads for which we are attempting to provide.

The first class—those uses related to agriculture—includes the town to farm and farm to town traffic characteristic of the more purely agricultural districts, the country to city and city to country traffic, which is fast-growing and highly important where adequate roads have been built radiating into the country districts from the large centers of population, and the traffic carrying crops or foodstuffs from productive areas which are isolated from rail transportation. Under this class should also be included the social, educational and religious activities which produce traffic from the farms to the schools, to the churches, and to the community centers.

The second—the recreational class—includes two distinct types of traffic, local and tourist. Local recreational traffic is continuous, and is not definite in its character. The automobile has been the means of combining a great deal of business and pleasure, and of the two kinds of recreational traffic the first is far more important, because it affects so much larger percentage of our population and the recreational value of the cotinuous outdoor driving and the increased social intercourse which has resulted, can scarcely be estimated in their effect upon a large percentage of the population, whose social and recreational activities up to the advent of the moderate-priced motor car were very limited.

The tourist traffic is a growing and highly important one, and this growth should be enlarged by providing adequate roads, so that interstate and transcontinental traffic will be encouraged. There is not a single state in the union that does not possess a locality of interest to the population both within and without the state. There is perhaps no better way to promote a broad Americanism than to make it possible through the building of roads, for the people of one state to know in a more or less intimate way something of the worth and beauties of the neighboring states, and this interest and knowledge should be sufficiently extensive to take in the national parks, forest areas, former battlefields and the many points which, through historical association and tradition, or because of their natural characteristics and environment, hold much of value to every man who places his country above all others. While traffic that may be included under the term "tourist" is fast growing, it is very small in comparison to the other recreational uses that are being made of the roads, and it is impossible not to foresee that this class can never be more than a minor percentage of the local recreational use of the highways. During the season of 1918, 54,596 private automobiles entered the eleven national parks, while during the same season approximately 450,000 people visited these same parks. These figures may be taken as indicating something of the tourist travel by highways when it is considered that a large amount of our western automobile travel makes the national parks its objective. But considering that this traffic is spread over a period of several months, it will be seen that if all of the automobile travel were confined to a single road, it would then only equal a daily traffic equal to that on many country highways outside of the influence of any large city, and would not begin to compare with the traffic on our heavy traveled thoroughfares in populous districts; but considering that the total number is spread over many western roads, it will be seen that this traffic is only incidental to the local uses which are made of the main thoroughfares.

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[*] Paper presented at the 5th annual meeting of the American Association of State Highway Officials, Louisville, Ky., Dec. 8-11, 1919.

[†] Chief, Bureau of Public Roads, U. S. Department of Agriculture.

The third class—the commercial use—is not strictly defined by this term, but as used in this discussion refers to the traffic on the highways resulting from the transportation of commodities between centers of population as differentiated from the collection of crops and distribution of commodities in the rural districts. This class of traffic would cover the carriage of commodities, much of it in package form, which now makes up the bulk of short haul freight and express. No doubt there will be a very large increase in this class of traffic on the highways, but the traffic which developed during the war is not normal and will not continue as the normal conditions reassert themselves. Just what will be the length of haul, which, because of its economy will go to the highways, has not yet been determined, but the only studies made by the Bureau, and these during the period of the war, indicate that 100 mi. seems to have marked the limit of such hauls. Even conceding that this class of traffic will develop very largely, it must of necessity be confined to those areas where the terminal points, consisting of comparatively large centers of population, are close enough together to allow at least daily one-way trips of the unit of transportation used, and our studies indicate that the limit is being reduced to perhaps 50 mi. It is not intended to overemphasize this limitation and is useful here only to point out that such studies as have been made up to this time indicate this fact.

The fourth—the military uses of the highways—is given fourth place not because of its lack of importance, but because the probable strictly military significance of the highways has been very considerably misunderstood. Any system of highways, which will serve the first three classes of traffic will adequately serve the military requirements except in certain particular areas. In such areas the highways must be provided which are demanded by the military authorities as a part of their plans for their military operations, but it must be accented that military highways as such are confined to restricted areas, and outside of these so-called vital areas, any system of highways that adequately serves the agricultural and commercial traffic will serve also the military purposes in either war or peace times. If, therefore, it is conceded that practically all of the traffic which we are now carrying on the highways has been defined in the foregoing classes, it is at once evident that, with the single exception of tourist traffic, the uses of the roads are largely local. There are no traffic counts which have been made sufficiently extensive to indicate that a general statement may be made that will correctly represent by percentages the use of the roads that is local, but those traffic counts which have been made would place this use as high as 90 to 95%, and it is very questionable if this percentage will increase very materially even as the roads are improved, for, although the total traffic on improved roads increases rapidly, it is doubtful if the average daily local traffic will fall below 90%, except on those roads which, because of their particular location, are built primarily for tourist travel.

These statements, it must be remembered, are intended to be very general in their character, and to cover the country as a whole, but it must be conceded that more than 90%, and possibly more than 95%, of the demand for better highways, arises from the local need for such improvements. The development of a national highway system must therefore take this fact into consideration, as opposed to the development of a system of national highways. There would be no advantage gained by considering the local uses of the roads as secondary. No plan of administration predicated on such an assumption can prevail, because it is an economic fallacy. That there is a demand for better facilities for tourist travel there can be no doubt, and that there is an increasing demand in localities for better facilities for through transportation of commodities is equally apparent, but that these needs now justify national intervention solely in their behalf, or that they are of such a nature that they cannot be met by a properly planned national system of highways, is open to serious question.

There is no evidence of fact shown by traffic counts, or any highway use of importance, that justifies a presumption that a need of national consequence is being overlooked. Now that we have the public support of a program of expenditures that will enable every highway building organization to proceed as rapidly as the material resources can be developed, we must meet, in the development of our highway systems, the economic needs of the nation for highways in the order of their importance. That these highway systems must be laid out along sane and sound economic lines is all the more important when it is evident that such a procedure will eventually produce systems of highway suited to the special needs of each locality, and yet be entirely adequate to meet all the requirements which those who are particularly interested in a system of national highways specify.

At the present time there is no more important problem confronting the American people than that of increasing the comfort and desirability of rural life, thereby stimulating the production of food products, and of equal importance to this is the necessity for providing better methods of distributing food products, and especially the perishable food products, to the consumer, without loss of time, and without these products passing through so many hands between the producer and the consumer.

Federal intervention through federal aid, if of assistance to these ends, is reasonable and proper from such standpoints alone. Indeed, such intervention may be said to have become imperative. The city population of this country has for years been growing rapidly, while the growth of the rural regions in many places has been negligible, and too often has been actually negative. The towns have held too many attractions in the way of social, recreational and educational advantages, but through the use of the motor car in conjunction with improved roads, these advantages in favor of town life can be largely overcome.

Beyond any doubt the war accented the need for more and better highways during the period of rail congestion, but if there is one need that the after-war conditions have brought close to every individual in the nation, it is a need for an adjustment of conditions that will allow people to be properly fed and clothed within the limits of their incomes; and so far as improved highways will help to accomplish this, they certainly will be held to fill a great national need. The population of the country has more than doubled since 1880. At that time only a little over 30% of the population was recorded by the Census Bureau as urban or some 16,000,000 out of a total population of 50,000,000 Today out of a total population of approximately 105,000,000, about half, well over 50,000,000 are urban dwellers. The effect of this condition is reflected in production figures. In 1880 the production of wheat was about 450,000,000 bu. per year, while during the period prior to the war it was only slightly over 700,000,000 bu. Similarly, in the case of corn, the production in 1880 was about 1,700,000,000, while prior to the war it was about 2,500,000,000. War conditions as to production were abnormal, so pre-war figures have been used instead of the later figures. From these figures it appears that the production of food has increased about as the rural population has increased. It is true that there has been some gain in the production of the individual on the farm, but the fact still remains that the total population has been increasing much faster than the rural population, and any effort that the Federal Government can make to improve rural conditions that will insure a sufficient rural population, and to provide means for bringing the producer and the consumer closer together, is justifiable, and from this standpoint alone federal aid for roads can certainly be considered to be at this time of great national assistance in one of the greatest of the national problems which we have.

The results accruing from the Federal Aid Road Law up to the present time, because of the conditions during the period from which we are just emerging, can not fairly or honestly be reckoned in the number of miles of finished road. The big result, so outstanding as to overshadow every other consideration, which can be primarily credited to the Federal Aid Road Act, is the amount and character of advanced road legislation which has been written into the laws of every one of the 48 states. These laws, in connection with the Federal Aid Road Act, have established on a firm basis, with adequate support funds, highway departments in all of the states which did not have highway departments prior to 1916. In the states which had highway departments prior to that time, the legislatures have enlarged and strengthened the authority and increased the support funds of those departments. This legislation has in general provided for more than the building of the federal aid roads, and in some of the states has included provisions for the building of the roads from the greatest to the least important. In addition to the legislation, great sums of money have been made available through the levying of special or general taxes, and through the authorization of bond issues. The Federal Aid Law should not be credited entirely with this changed viewpoint on the part of the public interested by the making available of such large sums, but it can be credited with appealing in a most forceful way to that characteristic of the human race which is perfectly willing to exert itself greatly to secure some award. Probably without federal aid the conditions after the war and the changed attitude of the public generally toward public spending on a large scale would have made themselves manifest, but certainly the Federal Aid Road Act can be credited with having turned the attention of the public toward the expenditure of public funds for highway purposes. It was not possible to go ahead with the actual production of roads on any considerable scale during 1917 and 1918. During the present year a large mileage of roads has been placed under contract, but the production has still been disappointing, due to conditions which are now well understood, but during this period there has been a remarkable development in the fixing of systems through the classification of roads, so that now we have in each state a system of main or state roads more or less definitely fixed, and in many of the states other systems of lesser degrees of importance. Many of these systems have been worked out very carefully and painstakingly, in fact it is doubtful if the highest administrative an executive officers of the state highway departments have devoted as much of their personal attention to any other single phase of the highway work as they have to the actual classification of roads. For the past three years this has been perhaps the chief and most important work that these men have accomplished, and its importance should not be under-estimated.

The proper classification of roads is basic and fundamental, and it has been demonstrated in those states which have carried out this classification in a careful, thorough manner, that people acting through their state legislatures have provided the ways and means for carrying out the program of improvement in accordance with the importance of these roads. Let it here be clearly understood that the people of this country will support a policy of road building which is based on their economic needs. It has been pretty well demonstrated in individual states that the mileage of the primary state roads cannot be restricted to too small a percentage of the total. Most of the states have found it necessary to add to their original conceptions of an adequate system a considerable mileage and where this action has not been initiated by the state highway department itself, it has resulted through legislative action. It has been pretty definitely established that a system of primary roads must be sufficiently extensive to give service to all parts of the state. It is hardly safe to fix the percentage without further inquiry, but it seems evident from the result in states which have made a careful study of their economic needs, that in the neighborhood of 5 to 7% of their total mileage will be included in their primary systems. This percentage may change slightly for the nation as a whole. Unquestionably at the present time federal aid should be restricted to the state systems, and since it is true that the state primary systems can in general be divided into roads of first and second importance, it might serve the economic needs of the states to confine federal aid expenditures to the roads of the first class in the primary system. It is likely that this will be more possible in the older states than in the newer states where it is absolutely necessary to develop a considerable mileage of roads in order to give the people access to all of the different sections of the state. That is, there are some sections in which a smaller mileage of high class roads is necessary to meet the traffic demands, and there are other sections in which a longer mileage of cheaper roads will as adequately serve the traffic needs, and which is the only policy that the public will support at the present time.

The step which seems necessary now is a definite plan of cooperation between the states and the Federal Government, which will insure that the primary systems of each state are connected up with the primary systems of the adjoining states, and that these systems, by agreement between the state and federal authorities, be held to until they are properly improved.

Up to the present time the Bureau of Public Roads has made its objective the perfecting of the administrative relations with the states. These relations have in general been placed on such a basis that better engineering standards can be developed and enforced, and it is undoubtedly a duty of the Federal Bureau to stand behind the states in their efforts to provide roads that will be adequate not only for present traffic but for future traffic. This point is of great significance, particularly in those states where roads are being built from bond issues and where it is doubtful if adequate maintenance funds will be provided for those types of roads which will require high maintenance cost.

It is true that the Federal Aid Act requires the greatest cooperation between state and federal authorities in order to make the plan outlined by the law an efficient method of operation, and yet it has as its fundamental basis a plan of action that will have to be used more and more in carrying out large public or private enterprises that are undertaken in this country, and the sooner this fact is recognized and put into operation the better it will be for the industrial life of the nation.

There is now comprised in the 48 state highway departments and the federal department a very large proportion of the engineers of this country who have had actual highway experience, and these agencies can, through cooperation, provide the most effective administrative organization that it is possible to devise. The fact that a considerable portion of these administrative officials are in close contact with the public in all the different localities of the nation, insures the development of the roads which will answer the greatest economic needs. In the law itself there are certain modifications which undoubtedly should be provided for in the extensions of appropriations for carrying out this act. One

(Continued on page 23.)

Development of Material Supplies for Proposed Heavy Programs; Suggestions Covering a Proper Inspection of Materials[*]

By A. B. FLETCHER[†]

It is indeed a day of heavy highway programs; we talk as glibly of forty, sixty or an hundred millions of state highway bonds as we did a few years ago of five or ten millions. We talk now of annual programs of highway construction of from ten to twenty-five millions without particular difficulty.

But talking about such programs is one thing and getting experienced engineers and assistants, finding enough contractors of sufficient ability and financial responsibility and securing the huge quantities of proper materials of construction promptly is quite another story.

Hardly any two states of the Union have the same problem to solve.

In some of the states where state highway activities are of very recent date the troubles with respect to the supply of materials of construction must be acute, and hardly any state has been accustomed heretofore to thinking of the supplies in terms of the enormous volumes we are now facing.

The public now in thinking or speaking of a state highway have in mind an expensively paved road. In general it may be said that the days of gravel or water-bound macadam roads are no more.

In most of the states the location of the principal supplies of gravel, sand and broken stone is fairly well known, but for extensive paving operations these supplies must be increased greatly and new deposits located if the highway work is to proceed with the dispatch desired by the public.

Often the engineer must decide whether he can or must use materials of somewhat inferior quality or whether materials of better quality can be shipped to the work by rail. These decisions often require nice judgment and no highway department can consider itself well organized without a geologist competent to assist the engineer in such matters nor unless it have a well equipped testing laboratory with trained assistants to operate it.

In many instances the material supply difficulty is not so much the lack of material as it is the failure of the railroads to ship it promptly and as ordered. In some states it is notorious that the railroads do not have enough suitable cars to give the needed service and this is true particularly at the crop moving periods. Hardly anything will do more to disrupt a highway contract than the failure of the railroad to furnish the materials of construction as they are needed.

This failure of the railroads, unless it can be corrected otherwise, would doubtless, in some states, under the heavy programs, justify the purchase of railroad cars by the state department for highway use.

If the railroad may be depended upon, the economical way of handling the materials, particularly such stuff as broken stone, sand and gravel, is to unload from the cars and place the materials on the road where they are to be used without unnecessary rehandling, which is always a costly performance.

Failing prompt railroad service—and in these days we rarely expect regular deliveries—one remedy is to stockpile the materials at convenient points. Sometimes, but not often, it is possible to haul the materials and place them in small piles within the right of way but more often they have to be placed in large piles near the railroad sidings.

The use of portable derricks or cranes with clamshell buckets lessens to a large extent the rehandling expense but whether machinery is used or not it seems obvious that the materials must be available when the contractor needs them.

It will also be found that because of the extraordinary number of motor trucks supplied by the Government to the states at an almost negligible cost much material may be hauled in these trucks for long distances. The ton-mile cost of hauling in trucks which cost the states practically nothing is greatly reduced if the factor of original cost of the trucks does not have to appear in the figuring.

Some of the states have adopted the practice of furnishing the materials of construction, or most of them, to the contractors. The writer does not know of any state which has gone so far as to own cement plants and rock quarries and to operate them but that such policy may have to be adopted by some states is by no means unthinkable. Indeed, the statutes of some states provide for such a contingency. For such states as have become accustomed to supplying the contractors with construction materials it would be a simple extension of their operations.

There is little doubt that the heavy road building programs will be in fashion for a long time to come so that the plant construction cost may be distributed over a huge quantity of the product. If the cement companies are unreasonable in their prices, for instance, a means for curbing them is available.

However, the money involved in such undertakings would be in large figures and could be allotted only with difficulty in some cases. "We want the money spent on the roads" is still the slogan of many of the thoughtless voters of state highway bonds.

It must be confessed, too, that under normal conditions no state operated cement plant can hope to compete with a privately operated plant on the cost basis.

There are many advantages and few objections to the state highway department furnishing materials to the contractor. A contractor with little capital is enabled to bid on work since he has little to finance outside of the labor and equipment items.

The contractor has no incentive to scamp on quantity or quality of the materials. Indeed, he must be watched to prevent his wasting them.

All disputes with the contractor as to the quality of the materials are eliminated.

Because of the larger volume of materials in which it deals, the state can usually secure lower prices per unit than can the individual contractor.

The contractor will insist, of course, on prompt deliveries. He will be much more critical in this respect than if he were doing the purchasing himself and he may make claims for damages due to faulty deliveries but the state should and can operate better than the contractor in this respect.

It costs something to handle the business end, of course, for purchasing agents and clerical people to buy and route the materials, and for this service the contractor, when he furnishes his own materials, charges from 5 to 10% of the value of the materials. This cost is reflected, necessarily, in the administrative costs of the state highway department and there is much bother conected with the supply of materials to the contractor. The advantages, however, seem to outweigh the disadvantages.

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[*] Paper presented at the 5th annual meeting of the American Association of State Highway Officials, Louisville, Ky., Dec. 8-11, 1919.

[†] State Highway Engineer of California.

So much costly paving is involved in modern state highway construction that the testing of the materials used becomes an important division of the work.

The geological work and the testing may be combined in one department without difficulty and a highly trained geologist may be placed in charge of both branches of the work.

It is hardly possibly to make up cost estimates until the sources of supply of the materials are known and the geologist and the testing engineer often settle the matter for the engineer.

After construction work begins it is necessary to know how the concrete mixtures, asphaltic and Portland cement, are working in order to get the best results, since, although the ingredients have all passed the specifications satisfactorily, the limitations of the specifications for the combinations nearly always permit some lattitude.

Also, it is interesting to know, for instance, the compressive strength of the concrete in the pavement slab after the road is completed.

A testing laboratory can be set up at no great cost, probably in no case exceeding $10,000, which will do all the testing required in the general line of work.

The United States Bureau of Public Roads requires the tests to be made and it seems to be advantageous to have the work done as a state highway department matter rather than to rely on private firms of testing engineers.

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The National Highway Act

Complete Text of the Revised Measure, Formerly Designated as the Townsend Bill, Introduced in the Senate on December 16 and Referred to the Committee on Post Offices and Post Roads

As a result of the discussion of the Townsend bill which was introduced in Congress some time ago, but failed of passage, the measure has been revised and again introduced in the Senate by Senator Townsend, the author of the original measure. The full text of the new bill, officially designated as "The National Highway Act," follows:

A BILL to provide for the establishment and maintenance of a national highway system, to create a Federal Highway Commission, and for other purposes.

Be in enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

That this Act may be cited as the National Highway Act.

Sec. 2. That when used in this Act, unless the context indicates otherwise—

The term "Federal Aid Act" means the Act entitled "An Act to provide that the United States shall aid the States in the construction of rural post roads, and for other purposes," approved July 11, 1916, as amended by sections 5 and 6 of an Act entitled "An Act making appropriations for the service of the Post Office Department for the fiscal year ending June 30, 1920, and for other purposes," approved February 28, 1919, and all other Acts amendatory thereof or supplementary thereto.

The term "commission" means the Federal Highway Commission created by this Act.

The term "highway" includes rights of way, bridges, drainage structures, signs, guard rails and protective structures in connection with highways, and housing facilities for employees engaged in construction or maintenance of such highways.

The term "State highway department" includes any department, commission, or official of a State empowered under its laws to excercise the functions ordinarily exercised by a State highway department.

Sec. 3. That a Federal Highway Commission is hereby created, which shall be composed of five commissioners, appointed by the President, by and with the advice and consent of the Senate. The commissioners shall be appointed with due regard to a fair representation of the geographical divisions of the United States. Not more than three of the commissioners shall be members of the same political party. The commissioners first appointed shall continue in office respectively for terms of one, two, three, four, and five years from the date of the taking effect of this Act, the term of each to be designated by the President at the time of appointment, but their successors shall be appointed for terms of five years, except that any person chosen to fill a vacancy shall be appointed only for the unexpired term of the commissioner whom he succeeds. Each commissioner shall receive an annual salary of $10,000. No commissioner shall, during his term of office, engage actively in any other business, vocation, or employment, or be interested directly or indirectly in any business enterprise connected with the production or sale of highway materials, or with the construction, maintenance, or operation of other highways or with any form of organized highway transportation. Any commissioner may be removed by the President for inefficiency, neglect of duty, or malfeasance in office. A vacancy in the commission shall not impair the right of the remaining commissioners to exercise all of the powers of the commission. Three commissioners shall constitute a quorum. The commission shall annually choose a chairman from its own membership, and it shall have an official seal, which shall be judicially noticed.

Sec. 4. That the commission shall establish an accounting division in its organization which shall devise and install a proper method of keeping the commission's accounts. It shall employ and fix the salary of a chief engineer and a secretary, whom it may also discharge and may employ, discharge and fix the compensation of such accounting, engineering, legal, clerical, and other assistants as it may from time to time find necessary. With the exception of the secretary, the chief engineer and laborers employed on or in connection with the construction, maintenance, or repair of any highway under its jurisdiction, all employees of the commission shall be appointed from lists of eligibles to be supplied by the Civil Service Commission and in accordance with the civil-service law. The President, upon the request of the commission, may authorize the detail of officers of the military, naval, and other services of the United States for the performance of such duties as the commission may deem necessary in connection with its business, but no additional compensation shall be paid to such officers for such employment.

Sec. 5. That all of the expenses of the commission made necessary in the performance of their duties, including all necessary expenses for transportation incurred by the commissioners or by their employees under their orders upon official business in any other place than at their respective headquarters, shall be allowed and paid upon the presentation of itemized vouchers therefor approved by the chairman of the commission. Unless otherwise provided by law the commission may rent suitable offices for its use, and make necessary expenditures for furniture, equipment and supplies, and for the printing and distribution of such publications and maps as it may prepare. The principal office of the commission shall be in the District of Columbia.

Sec. 6. That the commission shall establish, construct, maintain, improve, and regulate a national system of highways, composed of connecting interstate roads which shall, by the most practicable routes and with due consideration for the principal centers of agricultural and industrial production, afford ingress to and egress from each State and the District of Columbia. Such national system may include highways to and from important water ports, and highways connecting at the border with the main highways in countries adjoining the United States; but shall not include any highway in a municipality having a population, as shown by the latest available Federal census, of five thousand or more, except that portion of any such highway along which, within a distance of one mile, the houses average more than two hundred feet apart.

Sec. 7. That the commission may make all necessary surveys and maps in connection with the establishment, construction, maintenance, improvement, or regulation of the national system of highways, and may construct, maintain, improve, and regulate any highway which is a part of the national system, or, in its discreation, may contract with any State highway department for such surveys or maps, or for the construction, maintenance, or improvement of any such highway in such State. Any such contract with a State highway department shall be based upon and shall include plans, specifications, and estimates prepared by the commission, and the commission shall supervise and enforce the performance of such contracts.

The commission may purchase, lease, hire, or otherwise obtain all necessary supplies, equipment, and labor, and may operate and maintain such motor and other equipment and facilities as in its judgment are necessary for the proper and efficient performance of its functions.

Sec. 8. That the commission shall, from time to time, and subject to such changes as it may deem advisable, determine and select the highways which are to become a part of the national system and the order in which all or a part of such highways shall be established, constructed, maintained, or improved. In selecting or establishing such highways the commission shall consult with, and, if possible, shall obtain recommendations from State highway departments as to the routes which shall be followed in their respective States. Within two years after this Act takes effect the commission shall prepare, publish, and distribute a map showing the highways it has selected as a part of the national system, and at least annually thereafter shall publish supplementary maps showing its progress in selection and construction.

Sec. 9. That the portion of the national highway system in each State shall equal 1 per centum of the total highway mileage actually used as such in the State as ascertained by the commission. In every State where such 1 per centum will not suffice to enable the national highway system to afford at least two highways connecting with national highways in adjoining States, the commission shall increase the mileage of the national system sufficiently to provide two such highways.

Sec. 10. That the commission may select as part of the national system any highway or portion thereof which has been constructed by or in behalf of a State or civil subdivision thereof and accords with a standard deemed by the commission to be adequate for present and probable future traffic, or which, in the opinion of the commission, can be reconstructed to accord with such standard. The commission shall value the reproduction cost of any such highway at current prices and wages and shall construct, or may, in its discretion, contract with the State highway department for the construction of other highways connecting or correlating with the national system of a mileage equal in value to the highway or part thereof so selected, and to pay therefor out of the appropriation herein made. Such other highways shall be in addition to the mileage of the national system authorized in such State under this Act, but no part of the cost of maintenance thereof shall be borne by the commission or made an obligation of the Federal Government.

Sec. 11. That no money appropriated by this Act shall be expended in any State until the legislature of such State assents to the provisions of this Act and to the taking over by the commission of existing State roads or rights of way as a part of the national system, except that until the final adjournment of the first regular session of the legislature held after this Act takes effect, the assent of the Governor of the State shall be sufficient to authorize such expenditures. In consideration of the benefits to be derived by each State from the establishment of a national highway system, it shall be a condition precedent to the construction by the commission of any highway selected as part of the national system in such State, that the existing right of way on the route of such highway shall be transferred by the State or the proper civil subdivision thereof to the United States as fully as may be permitted under the constitution of the State.

Sec. 12. That the consent of the United States is hereby given to any railroad or canal company to convey to the United States for the purpose of this Act, any part of its right of way or other property acquired by grant from the United States.

Sec. 13. That if the commission determines that any part of the public lands or reservations of the United States is reasonably necessary for the right of way of any highway forming part of the national system or as a source of materials other than timber for the construction or maintenance of any such highway adjacent to such lands or reservations, the commission shall file with the Secretary of the Interior, a map showing the portion of such lands or reservations which it desires to appropriate, and if within a period of six months after such filing the Secretary shall not have certified to the commission that the proposed appropriation of such land is contrary to the public interest or inconsistent with the purpose for which such land has been reserved, such land may be appropriated and used for such purposes by the commission; Provided, That if at any time the need for any such lands or reservation for such purposes shall no longer exist, notice of that fact shall be given by the commission to the Secretary of the Interior, and such lands or reservations shall immediately revert to his control in the same manner as if they had not been appropriated by the commission.

Sec. 14. That the commission may aequire for the United States, by purchase or by condemnation under judicial process, any real estate or interest therein which in the opinion of the commission is necessary to carry out the provisions of this Act and which can not be acquired in any of the ways hereinbefore provided. Payment therefor shall be made from the appropriations herein or subsequently made for that purpose. It shall be the duty of the Attorney General of the United States, upon application of the commission, to cause proceedings to be commenced, within thirty days from the receipt of such application at the Department of Justice, for the condemnation of such real estate, and to prosecute such action with due diligence.

Sec. 15. That only such durable types of surface and kinds of material shall be adopted for the construction and repair of any highway which is a part of the national system as will adequately meet the existing and probable future traffic needs and conditions thereon. The commission shall determine the types of construction and reconstruction and the character of improvement, repair, and maintenance, in each case selecting the type and character which shall be best suited for each locality, proper consideration being given to the probable character and extent of future traffic. The commission shall establish an efficient method of maintenance for all highways comprised in the national system, which method shall be adequate for the needs of the traffic affected, and shall set aside such sums from the appropriations herein provided as may be necessary therefor.

Sec. 16. That all highways in the national system shall unless in the opinion of the commission rendered impractical by physical conditions, excessive cost, or legal obstacles, have a right of way of the width of not less than sixty-six feet and a wearing surface of an adequate width which shall not be less than twenty feet.

Sec. 17. That the commission is authorized to issue permits and licenses for openings into, crossings over or under, or the use of any portion of the right of way of any highway comprised in the national system for purposes not inconsistent with the Constitution or laws of the United States or of the State affected. In every such case the permittee or licensee shall be required to make such payment under such procedure as the commission may prescribe, as will be sufficient to repair completely any damages done to the highway, and the receipts from such payments shall be credited to the appropriations made by this Act, and may be expended in the same manner as such appropriations.

Sec. 18. That the commission shall encourage a more general use of public roads and highways and shall collect publish and disseminate, for the benefit of all sections of the United States, useful information, on highway transportation, construction, and maintenance.

Sec. 19.—That the commission shall prescribe and promulgate all needful rules and regulations for the carrying out of the provisions of this Act, including such regulations as the commission may deem necessary for preserving and protecting the highways and insuring the safety of traffic thereon.

Sec. 20. That all powers and duties relating to highways or public roads conferred or imposed upon the Secretary of Agriculture by the Federal Aid Act, or by any Act of Congress making an appropriation for the Department

(Concluded on page 24.)

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

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HIGHWAY ASSOCIATIONS AND THE PROBLEM OF HIGHWAY DEPARTMENT ADMINSTRATION

In the comment made in this column last week on the presidential address of A. R. Hirst before the American Association of State Highway Officials at its recent annual meeting, several points that might well have been touched upon were left out of the discussion on account of lack of space. One of these is so important that it is felt that reference should be made to it here.

Well towards the end of his address Mr. Hirst said: "It is interesting, although disconcerting, to note the almost total lack of interest on the part of road promoting organizations in the fundamental problem of getting proper administrative bodies to control the highway programs. We have good roads associations, trail associations, highway councils, etc., ad infinitum, all seeking to promote the construction of roads in detail or in mass, and urging the nation, the states, and the counties to spend millions or billions on highways of all kinds, classes, sorts, and conditions. The sole idea seems to be to get money and more money to build highways. It does not appear to matter to them what kind of highways, who builds them, or whether the people get a dollar's worth or a dime's worth for a dollar."

So far as the majority of the so-called good roads associations are concerned, this criticism is doubtless true. Associations for the promotion of special roads spring up almost daily and while most of them have entirely worthy objects, they do pay too little attention to the practical problems attendand upon the accomplishment of the projects they seek to promote. On the other hand, there are more than a few road organizations that do take into consideration these problems—that take into account ways and means for accomplishing their object as well as the object itself.

It may be that by referring to the associations he criticizes as "road promoting organizations," Mr. Hirst excepted those associations like the American Road Builders' that do make careful and worth-while studies of the highway engineer's manifold problems—those of administration, organization, construction and maintenance. If so, we can agree with him without reservation.

FUNDS FROM LONG-TERM BONDS FOR PERMANENT CONSTRUCTION ONLY

Pennsylvania counties may use funds derived from long-term bond issues only for work of a permanent character, according to a recent ruling by Commissioner Sadler of that state.

This ruling will meet the approval of all who have given any thought to the financing of road betterment work. It is good policy and in line with the trend of present opinion which is becoming more and more favorable to a sound business-like plan of paying for road work.

Not a little of the road work done in this country with money obtained from bond issues has cost too much because the bonds were for too long periods. Road improvement is probably the most important public work there is to be done and there can be no objection to carrying it on by means of issuing bonds, thus making possible a greater volume of work than could be financed from current revenues without too heavy taxation. But there is no reason for not adjusting the terms of the bonds to the life of the work they are to pay for.

BETTER WORK THROUGH BIGGER CONTRACTS

Some time ago this column was used to direct attention to the the desirability of bigger road contracts. The subject has been brought up again and in view of the fact that a real effort is being made to award contracts for next season's work well in advance of the opening of the construction season, it seems opportune to refer to the matter at this time.

One weakness in the prosecution of highway work in the past has been the awarding of contracts for short sections of road here and there over large areas. In most cases, without doubt, there have been good reasons for this practice, but its effects have been to keep the character of the work down and its cost up. The contractor having ten miles of construction to handle in a season obviously could not do the work so well or so cheaply if it were in ten widely separated contracts as he could if it were concentrated in one contract or even in two or three.

There are now indications that conditions are changing, that contract units are becoming larger and that the smaller jobs are being grouped together in comparatively small areas so that they can be handled almost as one job. This is partly due to the fact that the public demand for good roads is more and more for the improvement of continuous sections of considerable lengths, due, of course, to the desire for routes for long trips.

As a result of the letting of road work in larger contract units, many of the lagrer contracting organizations are turning to the highway field. These contractors were not attracted by the smaller jobs, but as the annual expenditures for road work become greater and the individual contracts become larger they see in the highway field an opportunity worth while. And they bring to the work more extensive and effective plants, better supervision and more skilled labor.

This means better work and, allowing for the increase in all costs during the past few years, better and more economical work.

Proposed Mississippi Road Bonds

State Legislature to be Asked to Authorize a $25,000,000 Issue for State Road System

During the past year many Mississippi counties have voted road bond issues in amounts up to about $500,000. Good roads development, interrupted by the war, has now come to the fore again and one of the results will be that the Legislature will be asked when it convenes next month to authorize a $25,000,000 bond issue for the construction of a comprehensive state road system, according to a recent report.

One of the chief advocates of the measure is the Mississippi Highway Improvement Association, an organization that was formed only a few months ago. It is said that the plan will have the backing of the administration and of the public.

The bill for the issue provides for retiring the bonds with funds derived from a special tax on automobiles, gasoline and oil. There are approximately 48,000 automobiles in the state.

Important Court Decisions in Arkansas

Supreme Court of Arkansas Declares Invalid Legislative Act Creating Road Improvements District in Marion County—Also Holds All Special Acts of Special Session to be Void

The Arkansas Supreme Court recently handed down a decision holding invalid an act passed at the regular session of the 42d General Assembly, creating Road Improvement District No. 1 of Marion County.

In the description of the contemplated improvements, the commissioners were given authority to "build, improve, widen, straighten and repair all public highways within the boundaries of said district which have heretofore been dedicated as public highways by the County Court of Marion County, or by the town council of the towns of Rush, Yellville and Summitt." A suit was brought attacking the act on the ground that it was unconstitutional since it povided for the improvement of the streets and alleys of the incorporated towns of the district and that this amounted to joining together in a single improvement the streets and alleys of three widely separated towns. The Court adopted this view, since, under the language of the act the improvements in a given municipaliy would have to be paid for by contributions from assessments levied on property in the other municipalities as well as upon rural property. Although an act correcting this defect was passed at the recent special session, it affords no relief, as an earlier decision of the Supreme Court held all special acts passed at the special session to be unconstitutional.

Only Permanent Improvements with Borrowed Money in Pennsylvania

State Highway Commissioner Sadler Rules that the Counties May Not Use Money from Long-Term Bonds for Building Roads Not of Durable Types

State Highway Commissioner Sadler of Pennsylvania has ruled that money derived from the sale of long-term bonds may not be used by the counties of the state for the construction of short lived roads. Under an act passed by the Legislature in June of last year, the State Highway Department is vested with the control of county expenditures for road work, and the Commissioner's ruling was made in reference to a proposal from Venango County that the proceeds of a $1,000,000 bond issue be used for the building of cinder roads.

The commissioners of Venango County were advised by Commissioner Sadler that the proposed procedure would be economically unsound. Continuing, he said:

"Our studies clearly demonstrate that a cinder road is not serviceable under modern conditions of transportation. Upkeep of such a road would be continuous and costly. When I tell you that maintenance of surface treated macadam highway costs this department from $500 to $1,500 per mile per year, you will understand what it would mean to attempt to spread thin the construction program to be paid for with borrowed money. Long-time bonds should not and must not be used to build short-time roads. We cannot consent to any improvement paid for with borrowed money—money borrowed for a long period of time—that is not an improvement of a durable type. Any other plan would be extravagant waste.

"If Venango County chooses to pursue a course of that kind, I would suggest the levying of an annual tax. The Highway Department proposes to exercise over large county bond issues the control given it in the act of June 12, 1919. To put down cinder roads would mean annual rebuilding. The continuing cost prohibits this type of constructtion. And long before the maturity of the bonds issued to pay for the cinders, the roads would have disappeared. Such procedure is economically unsound. The state cannot countenance such wasteful methods."

Road Bond Issue in Texas

List of District and County Bonds Voted for Roads in Texas During 1919, Arranged by Counties—Grand Total is $79.983,000

District and county road bond issues voted in Texas from Jan. 1, 1919 to Jan. 1, 1920, amounted to a grand total of $79,983,000, according to figures collected and compiled by the Texas Company. The totals for the 109 counties in which bonds were voted follow:

Anderson, $75,000; Bastrop, $320,000; Bee, $600,000; Bexar, $1,500,000; Blanco, $75,000; Bowie, $210,000; Brazoria, $200,000; Burnet, $70,000; Callahan, $100,000; Cameron, $300,000; Cass, $25,000; Chambers, $150,000; Cherokee, $650,000; Coke, $60,000; Coleman, $600,000; Collin, $2,815,000; Comanche, $750-000; Comal, $175,000; Cooke, $225,000; Cottle, $200,000; Dallas, $6,500,000; Delta, $1,000,000; Denton, $1,680,000; Eastland, $4,500,000; Edwards, $400,000;, Ellis, $1,212,000; El Paso, $800,000; Falls, $650,000; Fannin, $206,000; Fayette, $325,000; Fisher, $52,000, Franklin, $1,000,000; Freestone, $30,000; Gillespie, $200,000; Gonzales, $433,000; Grayson, $514,000; Gregg, $100,000; Gaudalupe, $100,000; Hardin, $510,000; Hartley, $75,000; Harrison, $1,750,000 Hays, $415,000; Henderson, $1,150,000; Hill, $2,401,000; Hood, $140,000; Houston, $425,000; Hunt, $2,000,000; Jim Hogg, $25,000; Jackson, $60,000; Johnson, $2,000,000; Kaufman, $1,800,000; Karnes, $300,000; Kendall, $50,000; Kerr, $265,000; Kimble, $150,000; Kleberg, $350,000; Lamar $1,500,000; Lamb, $50,000; Lavaca $200,000; Lee, $50,000; Limestone, $965,000; Live Oak, $130,000; Madison, $50,000; Medina, $800,000;Milam, $615,000; Montague, $125,000; Montgomery, $108,000; Moore, $30,000; Morris, $50,000; Nacogdoches, $800,000; Navarro, $66,000; Nueces, $2,000,000; Orange, $1,000,000; Panola, $135,000; Parker, $800,000; Polk, $800,000; Potter, $750,000; Rains, $250,000; Red River, $596,000; Reeves, $85,000; Rockwell, $800,000; Rusk, $800,000; San Augustine, $510,000; San Jacinto, $200 000; San Patricio, $375,000, Schleicher, $125,000; Shelby, $1,105,000; Smith, $1,500,000; Somervell, $60,000; Stephens, $3,500,000; Sutton, $300,000; Tarrant, $3,450,000; Taylor, $25,000; Titus, $1,000,000; Tom Green, $500,000; Trinity, $175,000; Tyler, $800,000; Upshur, $1,060,000; Uvalde, $450,000; Val Verde, $400,000; Walker, $40,000; Waller, $15,000; Washington, $1,500,000; Webb, $300,000; Wharton, $2,000,000; Wheeler, $120,000; Wichita, $1,500,000; Williamson, $1,500,000; Wood, $1,250,000.

MEETINGS

Calendar of Coming Meetings

Jan. 21-23—Associated General Contractors of America—Annual Meeting, Chicago, Ill. Secretary, 111 West Washington St., Chicago, Ill.

Jan. 29—National Highway Traffic Association—Annual Convention, International Amphitheater, Chicago, Ill. President, Arthur H. Blanchard, University of Michigan, Ann Arbor, Mich.

Feb. 9-13—American Road Builders' Association—Seventeenth Annual Convention, Tenth American Good Roads Congress and Eleventh Good Roads Show under the auspices of the A. R. B. A., 1st Regiment Armory, Louisville, Ky. Secretary, E. L. Powers, 150 Nassau St., New York, N. Y.

Feb. 26-28—Southern Appalachian Good Roads Association.—Tenth Annual Meeting, Asheville, N. C. President, A. D. Williams, Parkersburg, W. Va.

Apr. 12-17—United States Good Roads Association—Eighth Annual Convention, Hot Springs, Ark. Director General, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

Apr. 16-17—Bankhead National Highway Association—Fourth Annual Convention, Hot Springs, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

New York Highway Transport Conference

The Highway Transport Conference, held in connection with the Motor Truck Shows of 1920, held its sessions at the Conference Hall of the Armory of the Eighth Coast Artillery, 194th Street and Jerome Avenue, the Bronx, New York City, during the week of Jan. 3-10.

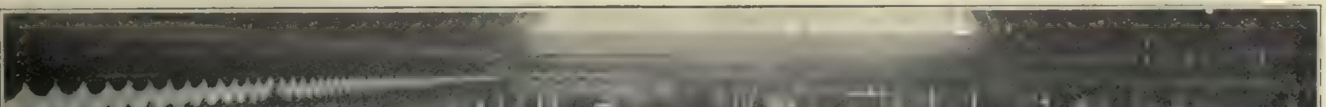
Two sessions were held daily, at 2:15 and 8:15 p. m. The afternoon sessions were designed especially for those engaged in the motor truck business. Prominent among the addresses presented were those relating to advertising and selling, such as those by:

L. A. Van Patten, on "Effective Advertising;" A. R. Kroh, of Goodrich Tire, on "The Farm Field;" Ray Sherman, Editor, "Motor World," on "Proven Sales Plans;". W. H. Moore, of the Garford Company, on "Developing Prospects;" F. W. Fenn on "Promoting Rural Motor Express and Farmer Sales;" Harry J. DeBear of Maxwell on "Training Salesmen," and several others.

Several speakers presented papers on the subject of motor truck shipping and its different phases. Among them were S. S. Merithew, of the Packard Co., on "Cost Accounting, Routing and Dispatching;" Joseph Husson, Editor, "Commercial Vehicle," on "Loading and Unloading Devices;" Ernest Farr, Firestone Co. on "Ship by Truck;" Harold B. Weaver, Consulting Engineer, on "Incentives for Drivers and Helpers," and others.

"Educational Institutions and Highway Transport" was to have been presented by Dr. P. P. Claxton, Commissioner, Bureau of Education, Washington, D. C. but the doctor sent a telegram that he was detained in Washington, so the subject was omitted.

Several addresses on the motor omnibus subject were presented. Among them was one by Commissioner Grover A. Whalen, of the Department of Plants and Structures, New York City, under the heading, "Replacing Street Cars with Motorbuses." In his address, the Commissioner related his experiences in establishing bus lines in New York City last summer, when the Federal Court directed the receiver of the New York Railways Company to discontinue operations on several unprofitable lines.



NEW YORK MOTOR TRUCK SHOW AT 8TH COAST ARTILLERY ARMORY, NEW YORK CITY.

To relieve congestion, said Mr. Whalen, the work was started with a few buses picked up wherever they could be found and put where most needed. The system has grown until now the city has 170 buses in operation, on seven different routes, covering 25 mi. of streets and carrying millions of passengers. He holds that the motor bus is bound to supersede the street car for several reasons: It requires no vast outlay of capital to build tracks and conduits or trolley wires; it requires no expensive power houses; consequently there is no basic charge for interest on dividends, and no vast appropriation for maintenance of "right of way." It will be found in Mr. Whalen's opinion that this economic condition alone will sooner or later cause the street car to disappear, and its place to be taken by motor driven omnibuses. Another reason is the quicker action of the motor bus, which is not blocked by obstruction, which takes on and lets off its passengers at the curb, without forcing them to run the gauntlet of the traffic of the street, which can make detours when necessary, and can generally keep up a more satisfactory service.

Mr. Whalen presented some figures based on his own experiences in New York City.

REVENUES	
100 Buses –92 in operation and 8 in reserve carrying 60,000 passengers a day	$3,000.00
EXPENSES	
Wages, interest, insurance, depreciation figured to daily basis	2,623.20
Daily profit	$ 376.80
Or an annual profit of	$137,532.00

For his estimates, Mr. Whalen places the original cost of 100 motor buses at $570,000, and the wages of 220 employees, with liability insurance, interest, depreciation and motor insurance, at $635,000. This, reduced to days, brings the daily expense account.

The addresses given particularly to highways and highway improvement were mostly presented Saturday afternoon, although S. M. Williams, Chairman of the Federal Highways Council, had taken up the subject of "Working for Highway Improvement," on Tuesday. On Saturday Arthur H. Blanchard, Professor of Highway Engineering at the University of Michigan, and recently president of the American Road Builders' Association, presented the subject, "Relation of Roads to Operating Cost," and a discussion followed led by M. O. Eldridge, formerly of the Federal Office of Public Roads, now Director of Roads for the American Automobile Association. H. Eltinge Breed, a former president of the A. R. B. A. presented "Problems in Highway Improvement." The discussion was led by Chairman George C. Diehl, of the American Automobile Association Good Roads Board.

State Highway Engineer W. G. Thompson of New Jersey presented an address on the subject of "Constructing Roads for Motor Truck Traffic." The vast amount of motor trucking in and across New Jersey during the war period furnished unusual data on this subject. The discussion was led by J. E. Pennybacker, Secretary of the Asphalt Association, formerly of the U. S. Office of Public Roads.

The truck show fully occupies the vast floor space of the immense Armory building. There are 172 exhibits, of which 72 are of complete vehicles, trucks, omnibuses, or other commercial vehicles, and 100 are accessories or other devices to make their use more serviceable under given conditions.

There was a considerable variety of motor buses; from the enormous affair which would carry 90 passengers, down to a vehicle big enough for two.

In addition to these exhibits there was the usual list of magazines, book and other publications, advertising specialties, insurance representatives, and others who are found at all large shows and conventions.

The show was well attended. The reports from various exhibitors showed large orders for trucks of various kinds and for many purposes. There was a large sprinkling of ladies to be seen both at the show itself and at the conferences in the conference hall, where, in addition to the addresses, moving pictures, mostly of the performances of commercial vehicles were shown daily.

Southern Appalachian Good Roads Association

The date of the meeting of the Southern Appalachian Good Roads Association at Asheville, N. C., has been changed from Jan. 15-16 to Feb. 26-28. The change in date, according to a recent announcement, was made to accommodate a number of state highway officials who could not be present in January.

The last previous meeting of the organization was held at Nashville, Tenn., in 1918.

The association covers the states of Maryland, Virginia, West Virginia, Kentucky, North Carolina, South Carolina, Georgia, Florida, Alabama, Tennessee and Arkansas, and a large attendance of delegates from those states is expected. The establishment of an interstate system of hard-surfaced highways will be one of the chief topics of discussion at the meeting.

Trailer Manufacturers Association of America

The first annual meeting of the Trailer Manufacturers Association of American was held at the new headquarters in the Grand Central Palace, New York, N. Y., on Thursday, Jan. 8.

Addresses on short-haul and terminal transportation and on patent matters were delivered by C. W. Reid, of the Federal Highway Council, and R. A. Brannigan, of the National Automobile Chamber of Commerce. A paper on advertising, by H. Colin Campbell, of the Portland Cement Association, was delivered by Mr. Price, of the Association's New York office.

The Trailer Association voted to apply for membership in the Chamber of Commerce of the United States of America and in the Federal Highway Council.

The desirability of standardizing the load rating of semi-trailers and pole trailers was discussed and agreed upon, and the general manager was instructed to obtain the views of the members as to the best methods to adopt towards that end.

It was voted to be the sense of the meeting that it was desirable to adopt a suitable slogan and emblem for use by the association and by the individual member companies in their advertising, on their stationery, in catalogs and on their products. Suggestions for a slogan and designs for an emblem are to be considered at the May meeting.

The work of the past year was reviewed and it was decided to continue the association's activities in 1920 along the same lines. The May meeting will be held in Detroit, Mich., and the September meeting probably in Cincinnati, Ohio.

J. H. Fertig was elected president to succeed W. E. Ferris, and C. H. Martin was elected to succeed C. A. Geiger. H. C. Fruehauf was reelected first vice president and J. C. Endebrock was reelected secretary-treasurer. J. H. Fertig and I. S. Byrum were elected as new members of the executive committee and W. E. Ferris, J. C. Endebrock, H. C. Fruehauf, W. R. Bonds and C. H. Martin were reelected to the committee.

The trailer companies represented at the meeting were as follows: Arcadia Trailer Corp., Detroit Trailer Co., Fruehauf Trailer Co., Wm. G. Hesse & Son Mfg. Co., Highway Trailer Co., King Trailer Co., F. P. Lyons Iron Works, Northway Trailercar Co., Ohio Trailer Co., Shadbolt Mfg. Co., Trailmobile Co. and the Warner Mfg. Co.

PERSONAL MENTION

Charles F. Keating has been appointed director of public works of Watervliet, N. Y.

Clarence H. Fay has been appointed commissioner of public works of the Borough of Manhattan, New York City.

Logan McDonald, of Lothair, Mont., has been elected county surveyor of Liberty County, Montana, with headquarters at

Harold L. Tillson has been appointed a district engineer of the Portland Cement Association, with headquarters at Des Moines, Ia. He will have charge of work in Iowa.

R. M. Morton has resigned as engineer of the Highway Commission of Sacramento County, California, to become chief engineer of the San Diego County Highway Commission.

Ira Taylor, formerly assistant drainage engineer of the Kansas State Engineering Department, has been appointed resident engineer on federal aid road work in Mitchell County, Kansas.

E. A. Ward, a division engineer of the Texas State Highway Department, has been appointed resident engineer of the Chamber of Commerce Metropolitan Development Association of Dallas, Texas.

Hugh L. Siegel has been appointed assistant to the president of the Walter A. Zelnicker Supply Co., of St. Louis, Mo. Mr. Siegel was formerly general sales manager of the Ford Roofing Products Co.

Fred Tarrant has been appointed maintenance engineer of the Division of Highways, Illinois Department of Public Works and Buildings, to succeed H. B. Bushnell, resigned. Mr. Tarrant was a district engineer of the division.

Lieut. A. B. Purnell, of Mineral Wells, Texas, has associated with Wm. W. McClendon, City Engineer of that place, in the practice of engineering. The firm, which is known as McClendon & Purnell, will specialize in municipal and highway work.

Wm. W. McClendon, who has been city engineer of Mineral Wells, Texas, for the past five years, has formed a partnership for the practice of municipal and highway engineering with Lieut. A. B. Purnell. He will continue to act as city engineer of Mineral Wells.

H. W. Holmes has been appointed bridge engineer of the Montana State Highway Commission, succeeding F. E. Phillips, resigned. Mr. Holmes was formerly with the Oregon State Highway Commission and later in the Engineering Department of the City of Portland, Ore.

L. L. Piersall, of the Kentucky State Highway Department, has been made chief engineer in charge of the Ohio River federal aid road between Louisville and Paducah. Before entering the employ of the department, Mr. Piersall was road engineer with the Louisville & Nashville R. R. Co.

H. J. Doolittle has been appointed highway construction engineer of Spokane County, Washington. For the past six years Mr. Doolittle has been a district engineer of the Washington State Highway Department. Spokane County is to spend about $3,250,000 in the costruction of some 300 mi. of roads. Mr. Doolittle will receive a salary of $5,400 per year.

Harry L. Shaner, formerly city engineer of Lynchburg, Va., has been elected commissioner of public works of Winston-Salem, N. C.

H. S. Allen has been appointed resident engineer on federal aid road work in Barton County, Kansas. Mr. Allen was formerly connected with the Atlas Portland Cement Co., in the Kansas territory.

C. A. Rothrock, formerly county road engineer of Morgan County, West Virginia, has entered the employ of the Portland Cement Association. Mr. Rothrock was at one time maintenance engineer of the Highway Commission of Los Angeles County, California. His headquarters will be at Parkersburg.

D. Q. McComb, formerly a major of Engineers, U. S. Army, has been appointed an engineer in the Bureau of Public Roads, U. S. Department of Agriculture. He has been assigned to work at Birmingham, Ala., and will have charge of federal aid projects in Jefferson County, Alabama, and also in Tennessee. Before enlisting, Maj. McComb was connected with the Pittsburgh Testing Laboratory.

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The Present System of Federal Control and Aid for Highways; Its Results, Merits and Limitations

(Continued from page 15.)

of these is the $20,000 per mile limitation, which is not now so much of a handicap but may later become so. There are roads being built where the grades themselves, because of the topography, will cost without surfacing nearly up to the limitation now imposed by the law. After these road grades are properly settled they should be surfaced where the traffic justifies. In many of the sparsely settled western states there are large areas of federally owned lands through which the state systems must be projected and in many cases the roads through areas of this character are necessary links in transtate or transcontinental lines. To prevent an undue burden falling upon the states which can ill afford to build such roads, consideration should be given to the extension of the appropriations which are now made for the building of roads in the forest areas. These roads in general are of two classes—those which are necessary for the administration of the forest areas themselves and those which form important links in the state systems. Again, there are roads notably in the western states but found also in some other localities which are of greater importance as links in transstate or transcontinental lines of travel than they are to the immediate locality. If the states in which such roads occur follow a program of providing first those roads which meet the greatest economic needs of their people, some of the through roads will necessarily be delayed for some time, and the advantage of a long line of improved roads on either side may be largely lost because of such unimproved stretches. To take care of cases of this kind consideration should be given to a provision which will allow the bearing of a greater part of the cost from the federal aid funds than the 50% now specified. Such procedure would undoubtedly be fair and reasonable, but if adopted it should be carefully restricted and guarded so that the roads which ought to be improved as links in long lines of travel will receive first attention.

These points summarize the most important modifications which it seems now necessary to make in order that the present Federal Aid Law through cooperation between the state highway departments and the Federal Bureau of Roads may meet satisfactorily the national need for improved roads, and insure the completion of roads in the order in which they meet the economic needs of the individual communities and thus of the whole nation.

The National Highway Act

(Concluded from page 18.)

of Agriculture, are hereby transferred to the commission, and the Secretary of Agriculture is hereby directed to transfer to the commission within thirty days after the appointment and organization of such commission, the personnel, equipment, material, supplies, papers, maps, and documents engaged upon or utilized in such work. The employees so transferred shall retain their present grades and salaries. The appropriations now available to the Secretary of Agriculture for such highway or road purposes shall continue in force and effect, under the control of the commission, in the same manner as they were in force and effect under the control of the Secretary of Agriculture prior to the passage of this Act. If, under the laws of any State providing for cooperation with the Secretary of Agriculture in the administration of the Federal Aid Act, the commission can not be legally substituted for the Secretary of Agriculture, the Secretary shall, pending a revision of such State laws, act jointly with the commission in the exercise of such powers of approval or disapproval as are incident to the administration of such Act. All powers and duties of the Council of National Defense under the Act entitled "An Act making appropriations for the support of the Army for the fiscal year ending June 30, 1917, and for other purposes," approved August 29, 1916, in relation to highways or highway transportation, are hereby transferred to the commission, and the Council of National Defense is directed to turn over to the commission within thirty days after the appointment and organization of the commission the personnel, equipment, material, supplies, papers, maps, and documents engaged upon or utilized in the exercise of such powers or the performance of such duties. The employees so transferred shall retain their present grades and salaries. The powers and duties of agencies dealing with highways in military or naval reservations under the control of the United States Army or Navy, or with highways used principally for military or naval purposes, shall not be taken over by the commission, but such highways shall remain under the jurisdiction and control of such agencies.

Sec. 21. Than on or before the first Monday in December of each year the commission shall make a report to Congress, which shall include a detailed statement of the work done, the status of each project undertaken, the allocation of appropriations, the expenditures and receipts during the preceding fiscal year under this Act and under the Federal Aid Act, an itemized account of the traveling and other expenses of the commissioners, and its recommendations, if any, for new legislation amending or supplementing this Act or the Federal Aid Act. The commission shall also make such special reports as Congress may request.

Sec. 22. That whoever shall willfully or maliciously injure or destroy any part of a highway embraced in the national highway system or property or material owned or controlled by the United States in connection with such highway, or shall willfully or maliciously violate any of the provisions of this Act or of the regulations prescribed and promulgated hereunder, shall upon conviction be fined not more than $1,000 or imprisoned for not longer than one year, or both: Provided, That nothing in this Act shall affect the civil or criminal jurisdiction of the States over persons or property upon such highways, or the rights and duties of the inhabitants thereof with respect to the use and enjoyment of such highways.

Sec. 23. That if any provision of this Act, or the application thereof to any person or circumstances, shall be held invalid, the validity of the remainder of the Act and of the application of such provision to other persons or circumstances shall not be affected thereby.

Sec. 24. That for the purpose of carrying out the provisions of this Act, there is hereby appropriated, out of any moneys in the Treasury not otherwise appropriated,, $50,000,000, which shall become immediately available; $75,000,000 for the fiscal year beginning July 1, 1920, and $100,000,000 for each of the three succeeding fiscal years; in all, $425,000,000, which shall be available until expended: Provided, That so much, not to exceed 5 per centum of the appropriation for any fiscal year made by this Act, as the commission may deem to be necessary for administering the provisions of this Act shall be deducted for that purpose and shall remain available therefor until expended. After making the deduction authorized by this section and such further deduction as the commission deems sufficient for maintenance, the commission shall apportion the remainder of the appropriation for each fiscal year among the several States in the same ratio that the mileage selected in each State bears to the total mileage selected in all States. These apportionments shall remain available for five years, and then if not spent through default of the State, shall be reapportioned among the other States in the same ratio.

Sec. 25. That this act shall take effect on its passage.

Crushed Rock for Minnesota Roads

Many Rock Crushing Plants Being Established in Anticipation of State's Need for Large Supplies of Road Building Materials—Rock and Gravel Amounting to 667,000 Tons Needed

New rock crushing plants are being established at many points in Minnesota in anticipation of the State Highway Department's need of large supplies of aggregates for carrying out its 1920 construction program, according to recent reports.

Largely because of a shortage of crushed stone or washed gravel, 58 mi. of road that were to be built last year were not completed. These roads are to be finished this year and in addition about 189 mi. of new construction requiring crushed rock or gravel has been authorized, making the total mileage scheduled for 1920 nearly 250 mi. This mileage does not include any city work.

It is estimated that the proposed program will call for about 667,000 tons, or nearly 20,000 carloads of aggregate.

New York State Highway Work

Text of Portion of Governor Smith's Annual Message Dealing with the Question of Roads

I favor the continuation of highway construction until a connected and completed system has been secured throughout the state. Realizing that such system is of utmost value to the state, and, in aiding farmers to get their products to market, will contribute to the reduction of the high cost of living, I recommend that highway construction be carried on without interruption and as rapidly as conditions will permit. I further recommend that highways be designed of sufficient strength to accomodate modern heavy traffic and that they be built of as durable a type as engineering skill and experience can design, in order that future maintenance expense may be reduced to the minimum.

As the unobligated balance of $10,000,000 from the second $50,000,00 bond issue will be required for contracts to be let in 1920, I recommend that careful consideration be given to a method of securing the funds necessary to complete a definite state system. I favor the pay-as-you-go plan, which the state has adopted for the construction or hospitals, libraries, normal schools, prisons and armories. It would be much better financiering to say that an armory, a state hospital or a state prison, calculated to last for years and years, should be paid for out of the proceeds of long-term bonds than it would be to construct from the sale of bonds highways subject to ever-changing traffic conditions and which last for but a short portion of the life of the bonds issued to build them. Experience has shown that the roads are rebuilt three and four times during the life of the bonds.

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CONSTRUCTION TRANSPORTATION MAINTENANCE

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Dust Preventives & Road Binders

By PREVOST HUBBARD

Chief, Division of Road Materials Tests and Research, United States Office of Public Roads. Octavo: 416 pages. Cloth: Illustrated, $3.00, postpaid.

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IF there are, in your community, plain macadam roads that are beginning to wear in spots, or to "ravel," you certainly ought to know about this Marquette-Negaunee Road—

It will show you how, at small expense, you can save your roads and make them smooth, dustless and durable.

Like many roads built in this country a few years ago, this Marquette-Negaunee road was plain water-bound macadam construction. But after it had been in use for a while the road authorities of Marquette County discovered that plain macadam would not stand up under the torture of modern traffic.

The road authorities had to find some way to save their road, which is an important main highway carrying heavy traffic. They turned to Tarvia as the surest and most economical solution to the problem.

They treated the road surface with "Tarvia-B" in 1917. In some places where the wear had been particularly severe a second treatment was applied in the summer of 1918.

Three different sections of Marquette-Negaunee Road, Marquette County, Mich. These roads were water-bound macadam, surface-treated with "Tarvia-B" in 1917 and 1918. This is the main line of travel between the busy mining cities of Ishpeming and Negaunee, Mich. A traffic census revealed the passage over this road of 1080 vehicles per hour, the majority of which were automobiles.

Today, instead of a ruined macadam road which would soon have to be rebuilt at great expense, Marquette County has one of the finest stretches of road in all Michigan, as the photographs show.

And the road can be **kept** in this same wonderful condition at small expense by occasional Tarvia treatments.

Advice on your own road problem can be had from the nearest Barrett office.

Special Service Department

This company has a corps of trained engineers and chemists who have given years of study to modern road problems. The advice of these men may be had for the asking by anyone interested. If you will write to the nearest office regarding road problems and conditions in your vicinity, the matter will be given prompt attention.

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THE HIGHWAY CONTRACTOR AND ROAD BUILDER

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Bituminous Road Maintenance in Rhode Island

The Maintenance Organization of the State Board of Public Roads and Methods Employed in Work by Section Gangs—Costs of Work

By M. M. CRANSTON*

The system of maintenance of the bituminous roads in Rhode Island now in force is the section gang method which has been found more practicable than the patrol system, as the section gang can be equipped with a tandem roller, heating kettle, pouring pots and the necessary small tools, and can carry out any maintenance work that may be necessary. The gangs are composed of a foreman and from four to six men. They fill all depressions and holes either with mixtures of asphaltic binder and varying sizes of stone or gravel or by the use of similar materials by the penetration method. The state is divided into six divisions, each under the direction of a division superintendent. A section gang works under the supervision of a division superintendent.

On January 1, 1919, the yardage of bituminous macadam roads in the Rhode Island system was 1,136,611 sq. yd., the total length being 121.66 mi. The Providence division alone had 306,323 sq. yd. of bituminous macadam roads. For the year of 1918 the average cost for patching was $0.018 per square yard.

In 1913 the problem of maintenance was being met by the extensive use of the patrol system. In 1914 the section gang method was employed, and it has been followed ever since.

In the early spring of 1913, the State Board of Public Roads faced a serious situation, as its recommendations for the necessary funds for maintenance work had not been acted upon favorably, and for the previous three years the available funds had been $400,000 short of the sums asked for, with only about $150,000 appropriated for the maintenance of 235 mi. of water-bound macadam road and 88 mi. of bituminous macadam road. The situation was made worse by the fact that an extensive building program had been carried out during 1912.

Confronted by this situation, the administration decided to patch the bituminous macadam roads, bring them to true surface and give them seal coats of asphaltic binder over the full widths. One example that clearly demonstrates the value of this method is the stretch on the main road between Providence and New London, Conn., passing through Hills-

Section at Hillsgrove—Seal Coate with Texaco Special Binder in 1913.

Section near Apponaug—Penetration Work with Texaco 96 Road Asphalt in 1915.

VIEWS ON THE PROVIDENCE-EAST GREENWICH ROAD IN RHODE ISLAND.

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*Engineer, The Texas Co.

grove, R. I. This road was constructed in 1912 with tar binder by the mixing method. In 1913 it showed signs of wear. The holes were filled with crushed stone, asphalt was applied by the penetration method, and the patches rolled. The entire width, 22 ft., was then given a seal coat of asphaltic binder, applied by an automobile pressure distributor at a rate of 1-2 gal. per square yard and covered with clean, sharp sand. The temperature of the material during the application was about 250 degrees F. The work was done at a cost of $0.0117 per square yard, including the cost of covering section previously noted, comprising 20,808 sq. yd.

In 1915 a traffic census taken on this road between 6:00 a. m., and midnight, for a period of eight days, showed a count of 19,992 vehicles, 96% of which were motor-driven, giving an estimated traffic of 300,000 vehicles a year. As the road is now carrying more and more trucking and jitney lines, it is fair to assume that the traffic is now 3,500 vehicles daily, 15% of which are trucks. The surface of this stretch of road is in excellent condition today and the maintenance costs have been as follows:

1915	$0.001 per square yard
1916	.003 per square yard
1917	.013 per square yard
1918	.008 per square yard

Other stretches of about 154,000 lin. ft. of road were given asphaltic seal coats at the same time and they show similar results and the same ability to carry all kinds of traffic.

A policy of increasing the widths of the existing roads and of giving all curves a one-way slope has been adopted by I. W. Patterson, Chief Engineer of the State Board of Public Roads. This operates to reduce the cost of maintenance by distributing the traffic over a greater width, at the same time making the roads safer.

In 1913 the state started the construction of roads by the penetration method, and a number of different roads built since that time with asphalt have uniformly required only very slight maintenance, costs on some of the work being as follows.

In 1915, 32,802 sq. yd. of penetration work was done at an average cost of $0.785 and the maintenance cost to date has been $0.017 per square yard.

In 1916, 221,394 sj. yd. of penetration work was done at an average cost of $1.16 per sq yd. The maintenance cost to date has been $0.019 per square yard.

Rhode Island, in building a road through a town, builds a wider road than the standard 18 ft., if the town wishes to pay for the extra width, but thereafter the state maintains the full width, and all cuts in pavements and all street openings by public utility, water and gas companies must be made during a short period of about a month in the early spring.

In 1915, about 21 mi. of road were seal coated with an asphalt binder and in 1916, but 1.25 mi. were so treated Very little has been done since. This shows that doing the work at the time it was needed made it unnecessary to do much to the roads for several years. The value of this work is attested by the following quotation, which is taken from the annual report of the State Board of Public Roads of Jan. 1, 1919:

"Our bituminous macadam roads appear to be holding their own well. We believe that the roads of this type are generally in far better condition now than they were five years ago. The seal coating of roads which required such treatment and careful maintenance of all these roads seem to have more than offset the deteriorating effects of age and traffic."

ooo

Highway Construction Costs in Arkansas

Charts Prepared by Engineers of Highway Department Show Variations in Costs of Road Work over Period of About Two Years

Interesting data on the costs of road work in Arkansas are contained in charts recently prepared by the engineers of the Department of State Lands, Highways and Improvements of that state.

The five charts, which appeared in the December issue of "Arkansas Out of the Mud," the department's official bulletin, show the variations in the cost of an average mile of gravel road from August, 1918, to October, 1919; in the cost of clearing and grubbing, per acre, from January, 1918, to October, 1919; in the cost of reinforced concrete and plain concrete during the same period; in the cost of 24-in. corrugated pipe and 24-in. vitrified pipe, in place, during the same period; in the cost of hauling and placing gravel from August, 1918, to October, 1919, the cost of moving fence during the same period, and the cost of unclassified earthwork from January, 1918, to October, 1919.

In discussing the charts, an article in the publication to which reference has been made, reads, in part, as follows:

"According to this chart, the cost of an average mile of gravel road in August, 1918, was about $8,800. This increased to the peak price of $10,600 in July, 1919, after which it dropped to about $10,400, the present average, and shows a slight downward tendency.

"The item of clearing and grubbing per acre varies from about $80 in January, 1918, to about $200 per acre in the summer of 1919, and it has since fallen to $175 per acre.

"Plain concrete has advanced from $19,50 in January, 1918, to about $28 at the present time, which is the highest point.

"Reinforced concrete, including the steel, has advanced from $26 to $34 in September, 1919, and is now tending downward.

"Twenty-four-inch corrugated pipe has advanced from $2.75 to $3.65; 24-in. vitrified pipe has advanced from $2.60 to $4.30, costing at this time more than the corrugated pipe, the lines of average cost having crossed in June, 1919.

"Less variation is shown in the cost of unclassified earthwork than in any other item. Starting with 40 ct., it has advanced to 55 ct.

"The cost of fence moving, starting with $1.05 in August, 1918, reached its highest point in December of that year, $1.15, after which it fell rapidly to the present low point of 55 ct. per rod.

"The item which enters most largely into the cost of gravel road is the hauling of the gravel from the pit to its place on the road. Starting with $1.25 in August, 1918, it advanced to $1.50 in January, 1919, after which there was a drop to 95 ct. in March, then a sharp rise to $1.55 in July, followed by another drop to $1.25 at the present time. This is for hauling, dumping and rolling and does not include the original cost of freight. The cost of each additional mile per cubic yard varies from 40 to 60 ct.

"No contracts were awarded during January and February, 1919, until after the extended roads program was formulated by the Legislature. The bids which were then made on projects started at a considerably lower point in the chart than they had been at the end of December.

"These estimates are based upon 100 or more low bids or contract prices and not upon an average of all bids. They are for the standard type of gravel road with 14-ft. roadway. The estimates should be regarded merely as approximate, representing average conditions in various localities depending upon local conditions. They are not published as a guide to any one in making bids, but merely to indicate the trend of prices. The highest type of roadway shows an increase in price of from 50 to 75%. No contractor should follow these figures blindly as there are innumerable local conditions entering into consideration on each individual project.

"One noticeable feature of the bids during the last six months has been the great variation for the same project, sometimes amounting to as much as 50% on the same road. It appears that the contractors had not been thoroughly advised as to conditions, or that they expected, on account of the large volume of work and the limited number of contractors, to get the contract at their own price with little or no competition.

"Should all districts now provided for undertake to build at the same time, prices would again go skyward, since there is only a limited number of contractors and outfits in Arkansas, or elsewhere, available for doing this work. The wise course to pursue would, therefore, be not to attempt to force all projects through at the same time, but to give the contractors time to do their work properly and by thus distributing the work, secure better prices.

"It is encouraging to note that since the peak prices of last summer, there has been a general downward tendency in practically all items, and under relatively normal conditions, this should continue for the future."

Progress in Highway Improvements[*]

By H. E. BREED[†]

The problem that concerns us today is not so much what has happened as what will happen in highway improvement. How are the road builders to meet the demands of the motor car builders and users?

This year I understand that there are in use in the United States over 7,000,000 passenger cars aggregating over 200,000,000 horse power, and over 500,000 motor trucks each weighing, with load, up the scale as far as 28,000 lb.

Not until one is part of a highway system does one realize what it means to sustain such traffic. You see the road as it affects your particular need of transportation. Can your car ride over it without damage or delay? Can the output of your factories find adequate highway service to satisfy your patrons? Can tours be taken without impediments from the highways? We, on the other hand, see not one but all roads as they are affected by not one car or line of cars, but by all this motor traffic, of which the figures above give only a suggestion. We want to build and maintain a system of highways in this country that shall give the greatest possible satisfaction to every motor car owner, user, manufacturer and consumer. Not every one will get all that he wants—far be it from us to rob the anvil of its function—but at least we want every one to get all that he needs. The public must have transportation of people and produce. You offer them the unit means for such transportation; we must supply the system upon which those units are to operate. When the highways can give adequate service to motor vehicle traffic, then, through cooperation with railways and waterways, the trinity of transportation will work out into a system that shall secure and enhance national prosperity.

In giving the public transportation service motor vehicles have outstripped the highways. Automobile production is a science down to the last turn of the last screw. Road building is still in the later experimental stage where the temptation to dogmatize is as great as the danger of doing it. The point of progress in road building today is the point passed in motor car building about ten years ago. Your improvement now is more in the perfecting of details; ours is still often in fundamental changes, such as better methods of drainage, closer relation of foundation to bearing power of surface, and so forth. Highway work has yet to discover a Mr. Henry Ford who will give a cheap and—may I say—perfect (?) pavement.

The motor truck has surpassed the highway in service for at least two reasons.

One: You have been dealing with units of transportation not systems and have been able to work toward the perfection of each unit.

Two: You have been able to give the units varying strength and power to meet the needs of prospective purchasers. If the loads were to be excessively heavy, the motor vehicle was built to stand them and a proportionately higher price charged. No motor car owner or user would think of overloading a light vehicle to the breaking point.

Yet that is exactly what happened to our roads, and that is why many of them have failed. We had to design for what seemed a fair average traffic. And suddenly the traffic increased by leaps and bounds, and many of the roads gave way under it. Few engineers had sufficient imagination to foresee the increase. Would you have foreseen it yourselves even as recently as 1912? And in any case adequate funds for durable pavements would not at that time have been forthcoming.

When the war-time traffic came and transportation by rail and water sagged under the strain of it, the motor trucks and cars were ready to help the highway into its own as an integral part of our national transportation system. They laid once and for all that ghost of an argument by which many a man would have worked out his taxes by digging the roadway in front of his door. Such roads were a mockery to the motor truck, and the motor truck was our salvation for short-haul freight. Even the dullest now see that road building for motor traffic is no job for an amateur. So by their preparedness the people who have used and produced the motor vehicles have clinched the need of good roads. Six hundred million dollars is, or soon will have been, appropriated for highway work in 1920. If this rate continues, and there is every reason to believe that it will, with an increase, over $3,000,000,000 will be spent on highway work in this country in the next five years. This, I think, is the greatest factor in our progress—that whereas even ten years ago appropriations for highway purposes were countered with indifference or antogonism, now, thanks to the service rendered by motor vehicles in the recent transportation crisis, there is strong and enlightened public opinion insistent in its demand for good roads and willing to pay the cost of them. All that remains now is for the public to see that it gets good roads for the money it is spending. This is of prime interest to motorists, and upon them highway engineers must depend for vigorous support in behalf of good measures and methods. Private and political interests must not be permitted to pervert the purpose of highway work.

A few technical facts may be useful in helping you get the kind of roads that you want.

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[*] Paper presented at the Highway Transport Conference held in conjunction with the National Motor Truck Show of 1920, New York, N. Y., Jan. 3-10, 1920.

[†] Consulting Engineer; formerly First Deputy Commissioner, New York State Commission of Highways.

So far our best solution for sustaining heavy traffic is in the so-called "durable" pavements. Hundreds of miles of them built during the last eight years have withstood the heavy traffic, with need for only slight maintenance. It seems probable that with some strengthening of design they will be able to withstand future increases. There are several types of durable pavement. Let me show briefly the progress made in the three that are most often used—bituminous concrete, cement concrete, and brick.

In the bituminous concrete we have eliminated the chief source of former failures. The bituminous concrete pavement is composed of small stones and sand, bound together by a mixture of asphalt or tar. By standardization of all materials according to physical and chemical tests we have ridded ourselves of the chance that nine parts good material might be spoilt by one part poor. The aid extended by the Federal Government to state highway work has resulted most beneficially in general adherence to standard specification. Clean stones and sand properly graded according to quality and size, and precise proportioning of the mixture so that just enough bituminous material is used to hold the mass together, have produced a pavement that you like to ride over. Formerly, the over use of bitumen in the mix frequently made the pavement so soft that it pushed and ridged under traffic. Now, using only just enough bitumen to start with, we depend upon the oil dropped from your cars to replace the volatile oils lost from the pavement. That means, of course, that the bituminous concrete pavement is most satisfactory where the motor traffic is fairly heavy. You have splendid examples of it on Fifth Avenue and on Riverside Drive. Another big improvement in this pavement is in the use of the semi-portable mixing plant. Formerly, the use of the so-called hot mixer resulted in all sorts of inequalities. Now all the materials are heated to the required temperature, and uniformity in the mix is obtained.

In 1918, 40,000,000 sq. yd. of asphaltic concrete were put under contract in the United States. In 1919, 50,000,000 sq. yd. were constracted for.

In the cement concrete pavement, there were formerly complaints about the uneveness of the surface. This was caused by bad joints and improper screeding. Both are now corrected. Through proper selection and grading of the aggregate—sand, stone and cement—by better methods of construction in the laying, screeding and curing, and by close engineering supervision, we have produced a hard surface that wears uniformly and is of excellent strength and quality. Most of you are familiar with the cement concrete roads that carry the heavy traffic on the east and west routes out on Long Island.

In 1919, 55,550,002 yd. of this pavement were put under contract in the United States. Its great popularity is due in part to its low cost of maintenance and its serviceability under all conditions of weather and traffic.

The brick pavement has seen the most radical changes. It is fine for city streets and pavements, and wherever the drainage is good. A few years ago to build this pavement we laid a concrete base and then a comfortable sand cushion in which to embed the bricks. You all know instances of what happened to brick pavements when a little moisture seeped between the bricks onto that sand cushion and froze and thawed, or when the sand in light fancy started to shift. Now we spurn the trouble-maker. We either set the bricks into green concrete and grout them so as to form a monolithic structure; or we form a semi-monolithic structure by laying the brick in a cuchion of sand sternly consolidated by cement. Both of these methods have given excellent results. They have been aided by a selection of better brick for road wear, and of a lug brick so as to permit more thorough grouting. The Dyckman Street Drive up the Palisades is an excellent example of the skillful use of brick in a highway. Twelve million square yards of this pavement were contracted for in the United States in 1919.

I believe our future improvement in actual pavement will proceed along the lines indicated—increasing elimination of the causes of failure, greater strength and durability with less need for maintenance, and, I hope, a lowering of cost. Of course, one never can tell what new invention may open up new possibilities. The highway field is a gold mine for the inventive genius.

But we have made improvements in other features beside pavement that also suggest future development. The actual engineering work on highways is becoming more and more a science. Courses in highway engineering are being undertaken at our leading universities, text-boods are written by authorities, men with a background of engineering knowledge and special training in highway work are going into the field. They will give us better service and save us from many an old-time blunder. Not so long ago the public regarded them as frills. Any one could lay out a road. Almost any one could build it. Why pay a so-called expert? Now, through the wastage of many millions in bungling work, the public knows that the highway engineer is among the most economical of necessities. That means progress. So does the recognition given highway work by the leading engineering publications. They are alert to catch and extend every bit of "news" in our field. Their service to the whole good roads movement is beyond estimation.

When I started work I almost lost my first job because I refused to lengthen a road 200 yards so that it would pass nearer the house of a certain politician. That couldn't happen today because the public, through the motorists, have learned to value good alignment It means the shortest line between two points that is compatible with low grade and with natural features like winding streams. Every saving in distance, every decrease in grade, means a saving in motor fuel and energy—a saving that in actual cash pays for the cost of the road within a comparitively short time. The new road between Englewood and the Fort Lee Ferry just across the river is an interesting example of this. It is 1.1 mi. long. Its cost, completed will be about $425,000. That road means a saving of 2 mi. for every motor vehicle traveling between the Fort Lee Ferry and the Passaic and Hackensack Valleys. There are an average of 2,600 such vehicles a day which represent a total saving of 5,200 mi. a day. Estimating the average cost of motor fuel, tires, and oil at 5 ce. 8 1-3 mills a mile, you save $303 a day. Within four years that road will have paid for itself under present traffic conditions—and, of course, the traffic will double or more as soon as the road is opened. Think of the saving in human time and energy.

Two other main improvements have been made in alignment, both for the safeguarding of life. We plan all new roads to avoid grade crossings of railroads, and we are eliminating old ones as fast as funds are available. We have also learned the risks of curves. No road is proof against the fool driver, but we're doing our best to protect the innocent against him by widening and banking curves. Wherever this is done there is a perceptible decrease in accidents. We want to devise more means for securing safety on our highways.

Drainage and strength of foundation we are constantly improving. The concrete pipe culvert has been a big help to the contractor. Foundations have emerged from guesswork that "about such a depth would probably do" to definite computation in respect to bearing power of crust and prospective traffic.

We are trying to devise a better system of sign posts and markings. The banding on poles to indicate trunk lines has been fairly satisfactory. Motorists would be of immense

(Concluded on page 33)

GOOD ROADS

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PROGRESS IN THE HIGHWAY FIELD

Although not addressed to road builders, the paper presented at the recent transport conference at New York City by H. E. Breed, formerly first deputy highway commissioner of New York State, and printed on other pages of this issue, is well worth the attention of those whose business it is to build and maintain the roads.

In the first place it shows both an appreciation on the part of the writer of the road user's viewpoint and an ability to present to the road user the road builder's point of view. Too many road men fail to put themselves in the places of those who use the roads and still more fail—or make few attempts—to put their own position before the layman in a way that makes it clear to him. It is highly important that these two classes understand each other, for the better that understanding is the more smoothly and rapidly will the work of road betterment go on. To be sure, the highway engineer has to build the roads and take care of them, but the users have to foot the bills.

In the second place, Mr. Breed very skilfully described the progress of motor vehicle development and of the technic of road construction. He pointed out clearly the difficulties encountered by road builders in providing for a traffic that outstripped the roads and traced the change in public sentiment towards the expenditure of money for road work.

While there can be no shadow of doubt that highway work throughout the country is being carried out on a vastly better basis than it was only a comparatively few years ago, there is still need of improvement. This must come through public support of road betterment work and that support will come only through a better understanding of the road builders' problems by the direct users of the roads and by the general public which is a less direct though no less real beneficiary of good roads. Road builders can do much toward bringing about this better understanding by taking the public into their confidence—laying their problems before the taxpayers and pointing out what support they need.

GROWING MOTOR TRAFFIC

The possibility of there being twelve million motor vehicles running on the roads of this country within a few years is something calculated to make the road builder think —to "sit up and take notice," so to speak.

And that is what is suggested by a well known automobile authority who is quoted elsewhere in this issue in an article on the motor vehicle industry in 1919.

According to this authority, and others, there are now probably nearly seven million motor vehicles in operation in the country. And about ten per cent. of these are trucks.

These have brought a multitude and a variety of problems for road builders to solve. What will nearly doubling the number mean to those who have to build good roads and then keep them good? And in what shape will the country's road system be to take care of that future traffic, even if improvement continues at the accelerated rate that is indicated by present road programs?

FOOD DELIVERIES BY MOTOR TRUCKS

It may be a far cry from the delivery of fresh fish by motor-driven "shops" by British trawlers to the distribution of bread by light "electrics" by American baking concerns, but both are manifestations of a common development—the almost phenomonal growth of highway transportation.

Before the era of the railroad, the highway was the one great avenue of overland traffic, both passenger and freight. For a time the railroad absorbed practically all the business, the highways falling into more or less disuse except for the most localized of local traffic and for that necessary to feed the railroads. Then the motor-driven vehicle was devised and brought to the point where it furnished a practicable means of haulage and, hastened to a remarkable extent by the exigencies of war, the tide of travel turned back to the highway.

These things have been said so many times and in so many different ways that they are almost universally recognized as facts and they are brought up here only as of some guidance for the future.

Just at the present there are few, if any, matters connected with the great business of transportation that are of greater moment than the probable future of the motor truck as a carrier. In this country at least, much will depend upon the final solution of the railroad problem. Elsewhere other factors will have large influence.

One thing, however, seems certain—the truck has come to stay. The limit of truck haul may—probably will—change; some believe that it will become greater, some that it will have to be less than at present. But for some time to come, the motor-driven vehicle operating over the public roads will doubtless take care of a large portion of the country's hauling. And the transportation of foodstuffs will evidently be one of its chief uses. The two examples cited earlier indicate how general this use has already become.

Minnesota's Road Program

The Work to be Done Includes 1,805 Miles of Grading, 1,530 Miles of Graveling and 192 Miles of Paving—Contracts to be Let Early

The proposed highway program of Minnesota for 1920 will provide for the improvement of 3,527 mi. of highways, according to figures recently anounced by State Highway Commissioner C. M. Babcock. The work will include 1,805 mi. of grading, 1,530 mi. of graveling and 192 mi. of paving, it is reported.

The paving projects are as follows: Benton County, Sauk Rapids to the Morrison County line, 17 mi.; Chisago County, Wyoming to Taylors Falls, 6 mi.; Crow Wing County, Crosby to a point 17 mi. north; Dakota County, 15 mi. in the vicinity of Wescott; Itasca County, Deer River to Keewatin, 50 mi., and Northome to a point 15 mi. south; Jackson County, Jackson City north and west, 5 mi.; Kandiyohi County, east and west of Wilmar, 10 mi.; LeSueur County, New Prague to Montgomery, 7.7 mi.; Morrison County, Little Falls to Royalton, 11 mi.; Pipestone County, Pipestone northeast, 12 mi.; Polk County, Crookston to farm school, 1.4 mi.; Renville County, Olivia to Bird Island, 3.8 mi.; Rice County, Morriscn to Warsaw, 4 mi.; Rock County, 3 mi. in the vicinity of Lucerne; Sherburne County, Elk River to a point beyond Big Lake, 9.5 mi.; Steele County, Clinton Falls to a point south of Owatonna, 7 mi.; Watonwan County, St. James to Madelia, 14 mi.; Winona County, North of Elba, 5 mi.

All of these are federal aid projects and it is estimated that approximately $4,000,000 of federal funds will be spent cn Minnesota highways in 1920. Plans are now in course of preparation for most of the foregoing projects and it is expected that the work will be advertised and the contracts awarded during January, February, March and April so that the work can be commenced early in May.

Views of Prominent Men on Federal Highways

American Automobile Association Quotes Replies of Gen. Wood, Senator Harding William J. Bryan and Governor Sproul to a Request for an Expression of Opinion

As proof that "Men prominent in national affairs who believe in a federal highways system are multiplying in numbers," the Good Roads Board of the American Automobile Association has made public replies received to a communication sent out by the board asking for definite expressions of opinion. The views expressed by Maj. Gen. Leonard Wood, Senator Warren G. Harding of Ohio, William Jennings Bryan and Governor Sproul of Pennsylvania follow:

General Wood. "It is especially important that we should provide for continuous maintenance; in other words, those roads should always be kept in condition for service and never allowed to reach the stage when general repair is necessary.

"You may feel that undue emphasis has been laid upon the military road, but in considering this project the fact must be borne in mind that, while these roads are vitally important as a possible military necessity, they will serve every commercial purpose.'

Senator Harding: "I am quite ready to cordially support federal aid in the construction of highways which shall be so selected as to facilitate what might be termed federal travel; that is to say interstate communication. I have no doubt Congress will be very generous in supporting the good roads movement.

"My own conception of the highest service to be rendered in the cause of good roads is federal influence toward road maintenance after the construction is completed. The greatest crime in the expenditure of public funds at the present time lies in the enormous outlay of money for road improvement, only to be followed up by utter neglect in keeping them in repair."

William Jennings Bryan: "The time has come for the systematic development of national highways and the conclusion of peace gives an opportunity to celebrate the ending of the greatest of world wars by the building of a memorial Peace Way, reaching into every state and forming a commercial bond of union between the commonwealths of the nation. It would greatly relieve the railroads by furnishing a roadway for both passenger and freight traffic."

Governor Sproul: "The interest on the money which we advanced to our allies would build each year six modern paved highways from the Atlantic to the Pacific and six more from the Canadian line to our southern boundary. The principal sum of our ten billion dollars in loans would give us a network of paved roads over the entire country, only 30 miles apart, north and south and east and west. The figures are important as showing what may be done for our own people under a far-sighted policy of national improvements."

An Interesting Demonstration

Condition of the Sheet Asphalt Pavement on Fifth Avenue, New York City, After Heavy Traffic of Military Parade is a Striking Example of Healing Quality of that Type

The tendency of asphaltic pavements of some types to "iron out" under heavy traffic, especially in warm weather, subsequently showing little or no sign of previous superficial defacement, is well known to engineers. An especially striking example of this property is afforded by the sheet asphalt pavement on Fifth Avenue, New York City.

Last summer the avenue was the scene of a number of military parades, some of which included particularly heavy vehicles. The accompanying illustration shows a part of one of these parades. Despite the marring of the surface by these tanks, ammunition wagons and other military paraphernalia, a few weeks afterward there was no indication of damage, the pavement having "ironed out" under the normally heavy motor traffic it carries.

It should be noted, however, that this pavement is an especially well constructed one. It has been down over six years and is still in good condition, although it is on one of the most heavily traveled streets in the world.

VICTORY LOAN PARADE PASSING DOWN FIFTH AVENUE, NEW YORK CITY

HIGHWAY TRANSPORTATION

Bread Delivery by Electric Truck

Many Large Bakeries Recognize Advantages of Electrically Operated Trucks in Urban Service Where Cleanliness is Big Factor

Many of the largest baking concerns in the country are utilizing the electric vehicle for making bread deliveries, according to figures recently given out by the Electric Vehicle Section of the National Electric Light Association.

Approximately 1,200 electrics are employed by 25 of the representative bakeries which are listed by the association. Their names, the cities in which they operate and the number of vehicles utilized follows:

Ward Baking Co., eight cities, 400; Ward & Ward, Inc., Buffalo, N. Y., 120; Ward-Corby Co., Chicago, Ill., 70; Case & Martin Pie Co., Chicago, Ill., 65; Consumers Bakery Co., Kansas City, Mo., 65; Cushman Sons Co., New York, N. Y., 56; Mills-Fox Baking Co., Detroit, Mich., 55; Ward Bros. Co., Inc., Rochester, N. Y., 50; Campbell Baking Co., Kansas City, Mo., 40; Loose-Wiles Biscuit Co., New York, N. Y., 35; Shultz Bread Co., Brooklyn N. Y., 35; Old Homestead Bakery, San Francisco, Cal., 30; Flour State Baking Co., St. Paul, Minn., 26; Schulz Baking Co., Chicago, Ill., 25; General Baking Co., New York, N. Y., 25; Horn & Hardart Baking Co., Philadelphia, Pa.; 20; Wright Cake Co., Brooklyn, N. Y., 16; Corby Baking Co., Richmond, Va., 11; Jay Burns Baking Co., Omaha, Neb., 11; Memphis Bread Co., Memphis, Tenn., 11; Bridgeport Bread Co., New York, N. Y. 10; Campbell-Sell Baking Co., Denver, Colo., 10; Consumers Baking Co., Paterson, N. J., 10; Huber Baking Co., Wilmington, Del., 10; Schmidt's Bakery, Harrisburg, Pa., 10.

This list shows the popularity of this particular type of vehicle for the service required. Its special advantages, it is claimed, are its cleanliness and its flexibility. As a rule the service is urban, requiring many stops and not excessive mileage. Its operating cost is also low and it is easily handled.

The Cushman fleet in New York City is one of the most recent installations. In March of last year the company purchased 14 1-ton vehicles, in April 2 6-ton, in May 30 ½-ton and in December 10 ½-ton—a total of 56. It is expected that further additions will be made to the fleet during the present year.

Trawlers Distribute Fish by Motor

Organization of Trawlers in England Commences Delivery of Fish to Consumers by Motor "Shops"

Trawlers at Hull, England, and other fishing ports are cooperating in a $5,000,000 organization for the delivery of fish to the consumers by means of motor vehicles, according to Homer M. Byington, American Consul at Hull, in a recent number of the "Commerce Reports."

"It was originally intended, the 'Yorkshire Evening Post' states, that the scheme should be a local one, and its initial capital was only $25,000," Mr. Byington writes, "but it has since developed into a national undertaking and the capital was increased first to $250,000, then to $1,250,000, and now stands at $5,000,000. Hull was the pioneer port of the scheme, but the plan is being extended to other ports along the coast, so that ultimately the whole trawling industry of the country will form one big fish catching and distributing agency.

"The idea grew out of a desire on the part of the trawler owners to eliminate waste, to reduce the price of fish to the public, and to guarantee that the public obtain supplies that are fresh in every sense of the word. The scheme of distribution is by means of a fleet of motor 'shops' of special construction and design and fitted up with counters that display the fish in a manner similar to that of ordinary retail shops. These motor vans operate from the dock side to the various distributing centers, covering all the streets and thoroughfares in and around the ports.

"When the radius of distribution is beyond the capacity of the motor shops, larger lorries will be utilized as well as railway transit. In any case the method of distribution will be governed by speed and the ability to keep the fish fresh. Special wells have been fitted to the shops in which the fish is kept until sold, and special staffs have been engaged to handle the fish in such a manner as will guarantee its reaching the public in a fresh and proper condition.

"In outlining the scheme to a newspaper representative, the general manager of Fresh Fish Supplies (Ltd.) stated that negotiations are in progress all over the country for establishing a big chain of motor shops operating from all ports. They are already installed in the East Riding of Yorkshire, and the necessary arrangements have been made for opening up in Manchester and other big centers."

Motor Truck Regulations in Pennsylvania

State Highway Commissioner Sadler's Rulings on Lights and on Maximum Width of Machines

State Highway Commisioner Sadler of Pennsylvania has recently ruled that owners of large trucks, who are unable to secure adequate lights because of manufacturing difficulties, will be granted registration licenses on their promise to secure proper lights at the earliest possible date. In discussing the matter with a delegation from the Motor Truck Association of Philadelphia, Commissioner Sadler said:

"There will be 500,000 motor vehicles in Pennsylvania in 1920. Possibly 50,000 will be trucks. The rights of the other 450,000 owners of cars must be protected and respected. Regulations which apply to passenger cars and to small trucks equipped with illuminating devices must apply to the larger trucks. Drivers of passenger vehicles must not be compelled to drive in fear of inconsiderate drivers who know that in a collision their large vehicles would suffer only slight damage. You say the manufacturers cannot supply lights for large trucks before January 1. In that event we will license the big trucks on condition that the applicant sets forth in a rider made part of the application the fact that he has placed an order for lights. If, within a reasonable time, they do not equip themselves, we shall revoke their licenses."

Commissioner Sadler also called attention to the fact that many trucks so constructed that the driver can not see the road in the rear are not equipped with fender or other mirrors. He said that the law governing this matter would be strictly enforced. The Highway Department receives many complaints of truck drivers who refuse to permit vehicles to pass them and who excuse their actions by the claim that the noise of their engines prevents their hearing signals.

In the matter of licensing trucks having widths in excess of the 90 in. fixed by law, Commissioner Sadler announced that there could be no deviation from the provisions of the law. He also said that the law relative to weights would also be strictly enforced.

"It is not the idea of the Legislature or the State Highway Department in any way to interfere with the development of truck transportation," Commissioner Sadler said.

"Trucks are here to stay. But we must consider them from five points of view—length, breadth, weights, lights, and the character of the persons operating them. Because of the heavy trucks in use, and the foundations we must build to carry them 365 days a year, our roads are costing us $25,000 a mile more than would be necessary had we only passenger cars to contend with. We asked the Legislature to set a truck weight so that we could build our roads to carry that weight. They have fixed a limit of 26,000 lb. We are building our roads accordingly. And trucks must stay within that weight. Our regulations have all been made for the safety of the traveling public. We ask the truck owners and manufacturers to cooperate with us. The day of the road outlaw is past."

Automobile Industry Broke Records in 1919

Number of Vehicles Manufactured, Value of Cars and Trucks Made and the Number Exported Greater Than in Any Other Year

The year of 1919 was a record breaking year in the automobile industry, according to figures compiled by Alfred Reeves, General Manager of the National Automobile Chamber of Commerce, and recently given out by that organization.

"Notwithstanding the small production during the first three months of 1919, following the armistice, when the industry was on practically a 100% war basis," Mr. Reeves said, "motor car manufacturers made such gigantic strides during the other nine months that the year's production of 1,891,929 motor vehicles exceeds all previous records, including 1917, when 1,868,000 cars and trucks were produced. The wholesale value brought the industry almost to the two-billion-dollar class."

The increase in number of vehicles manufactured was due to the great increase in the manufacture of trucks, for the total production of passenger cars was slightly less in 1919 than in 1917. During the former year, about 1,740,000 passenger cars were made, while in 1919 the number was 1,586,787. On the other hand, the truck production increased from about 227,000 in 1917 to more than 305,000 in 1919.

The total wholesale value of the cars and trucks produced during 1919 was $1,807,594,580. This, it is stated, when combined with the value of bodies, spare tires and accessories brings the industry close to the $2,000,000,000 class. The wholesale value of the passenger cars made was $1,399,282,995, or an average of $882 per car, while the corresponding figures for trucks were $408,311,585 and $1,338.

PASSENGER CAR PRODUCTION

Year	Number	Wholesale Value
1899	3,700	$ 4,750,000
1904	21,281	23,634,364
1909	127,731	159,918,506
1914	543,679	413,859,379
1917	1,740,792	1,053,505,781
1918	926,388	801,937,925
1919	1,586,787	1,399,282,995

MOTOR TRUCK PRODUCTION

Year	Number	Wholesale Value
1904	411	$ 946,947
1911	10,655	22,292,321
1917	128,157	220,982,668
1918	227,250	434,168,992
1919	305,142	408,311,585

In discussing the distribution of motor vehicles over the country, Mr. Reeves said:

"The biggest percentage of increase in the registration of cars during the past two years has been in the agricultural districts. The leaders are Tennessee, Alabama, Louisiana and Georgia, where the percentage of increase over 1918 has ranged from 29% down to 16%. New York has the greatest number of cars registered, approximately 570,000, or one for every 18 people in the state. Ohio is second with about 511,000.

"Nebraska and Iowa are pretty close for the honor of the greatest number of cars per capita, Iowa with 365,000 and Nebraska 201,000 or one car for every 6½ persons.

"Mississippi has the fewest cars registered, less than one for every 50 persons, with Alabama next—one for every 43 persons. Better roads are expected to change this situation."

Figures on the production of passenger cars and motor trucks during past years are shown in the accompanying tables.

Exports now amount to only about $110,000,000, according to Mr. Reeves, but this should increase substantially during the next few years.

"Just how many cars can be used in the United States depends entirely on the improved roads and bettering traffic conditions in big cities by the use of underground garages and parking spaces for cars not in use," Mr. Reeves continued. "There are many who believe that a few years from now will see 12,000,000 motor vehicles running in this country."

Truck Traffic Increase in New York City

Number of Motor Trucks on the Streets of New York City has Increasid 53% in Past Three Years—Present Congestion Would be Worse but for Advantages of Truck Hauling

The number of motor trucks on the streets of what is designated as the New York City district has increased 53% in three years, according to a statement from the New York City branch of the Secretary of State's office. The district referred to includes Greater New York and five surrounding counties.

In 1917, according to the statement, licenses were issued for 32,577 motor trucks. In 1918, there were 41,385 issued and up to Dec. 1, in 1919, there were 49,849 issued.

In discussing the idea, prevalent in some quarters, that this increase in the number of trucks is responsible for the increasing congestion of traffic on the main thoroughfares of New York, the International Motor Co. argues that the congestion would be worse if it were not for the motor truck. It is argued that: "The percentage of increasing congestion in relation to the percentage of increasing demands for transportation has, as a matter of fact, been kept down by the economies offered by motor trucks. Their flexibility in traffic, speed, and larger capacities make them more desirable than horse-drawn equipment and the very fact that their use has increased to this extent proves that they are an economic necessity to the city and should not be discriminated against."

The streets of the city are seriously over-crowded and, according to Vice President Fulton of the International Company, "Freight transportation by motor truck in the big city has very nearly reached the saturation point under the present lack of definite regulations."

The Motor Truck Traffic Manager

Automobile Distributor Sees Rise of a New Calling as a Result of the Development of Haulage over Highways by Motor Trucks

A new calling, that of motor truck traffic manager, has been created in American business by the growth of highway transportation by motor truck, according to Sidney B. Bowman, of the Sidney B. Bowman Automobile Co., Kissel distributor for New York.

"The business of the motor truck traffic manager," he said in a recent statement, "is to study the area over which his trucks operate in the hauling of goods, supplies and material. The object of his job is to deliver and haul goods in the quickest possible time and at the least operating cost per ton-mile. To accomplish this he should have at his finger tips the shortest and best route to any given destination, the location of terminals and transfer points, the loading and unloading facilities of every buisness concern and house he does business with. He must even have it figured down as to the exact time a truck of given size, loaded with a certain tonnage, will arrive at a given point.

"The motor truck traffic manager also informs himself regarding mileage between all points, the locations of garages, service stations and supply depots, and should, in addition, be an expert in the efficient loading and unloading of all kinds of motor truck bodies.

"All of these specific points the motor truck traffic manager has before him as each load is sent out. He occupies the same position as the train dispatcher on a railroad system. By thus operating his trucks along these lines he does not duplicate area, cutting out immense waste of gasoline and oil and wear on tires. And if the operation is carried out accurately and systematically, all of the trucks can be in the home garage at a certain time at the end of the business day."

Of the first 50 Pierce-Arrow motor trucks 48 are in operation today after eight years' use, according to a booklet recently published by the Pierce-Arrow Motor Car Co. The booklet, entitled "The First Fifty," contains a history of each of these veteran machines, which were manufactured in 1911.

The International Motor Co., manufacturer of the Mack truck, is to publish a house organ called the "Mack Bulldog," according to an announcement recently made by D. O. Skinner, the company's advertising manager. The publication will be 9x12 in. in size and will be profusely illustrated, it is stated. It will be devoted to articles of interest to users of trucks and others in the motor truck field, and will pay especial attention to the adaptation of the truck to different fields of business. H. C. Bailey, formerly manager of the Mack branch in St. Louis, will be the editor.

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Progress in Highway Improvements

(Concluded from page 28.)

help if they would send in written suggestions to highway departments or formulate recommendations through their organizations.

May I note briefly two other factors of progress, and one urgent need?

Ten years ago the contractor in highway work was often an individual of small capital, limited backing and general irresponsibility. Today, through the opportunities the work offers, he is generally a man of large affairs, sound business integrity and ability to handle big jobs. The long contract in highway work and the need for continuity of operation developed through the extensive use of machinery, has attracted to road building men who have established reputation in other lines of construction work. It has very much raised the standard of highway contracting and lessened the temptation to petty cheating.

Largely through the big contractor, we have made another improvement—the use of machinery. The big contractor can afford to make a larger initial expenditure in plant. With the present labor shortage this is of great importance in carrying out our program. Under old methods of hand excavation unloading and manipulation, it took 103 men and 16 teams to do the same work that can be done today by 43 men, 5 teams and 2 motor trucks, with a steam shovel, roller and scraper, unloader and mixer loader. With the use of the industrial railway and other mechanical appliances, we are going still further to decrease the use of hand labor and to increase the standard of intelligence required in highway work.

There is a pressing problem before all of us, upon which you can take immediate action. You all know the danger and delays caused by weak bridges. Bridges have lagged farthest behind in improvement, because they are not regarded as an integral part of the highway system. Along roads that are bearing 14-ton loads you constantly meet bridges designed for only 10 tons. In New York State there are 33,775 bridges. Of a total of 251 bridges on three main traveled routes from the Pennsylvania state line to New York City only 115 are built for 15 tons or over; 17.5% of them are built for less than a 5-ton load. Twenty-three of them would stand less than 3 tons. On the less traveled routes the status of bridges is even worse. It is as menacing in other states as it is in New York. This matter should be rectified at once by petitioning our legislatures for funds with which to bring our bridges up to required capacity. Otherwise the progress of our whole system is threatened by its weakest link.

Along these lines have we progressed. There is zest in the distance that we still have to go before we can quite satisfy you. Whether that distance is merely to be extensively covered by a large mileage of roads, low in first cost, but ultimately expensive because of high maintenance, or whether it will be developed intensively with durable pavements, is a qustion of policy that the motorists will do much to determine.

———OOO———

Pennsylvania, according to a statement made by Assistant State Highway Commissioner Geo. H. Biles, built more miles of modern highways than any other state in the Union in 1919

The Weather Bureau of Minneapolis, Minn., is furnishing a "highway weather service" that is becoming very popular, according to recent reports. The service is designed especially for the benefit of commercial hauling over the highways.

Huntington, Long Island, has voted to have $500,000 worth of concrete highways under a bond issue, and has approved the highway budget submitted by the town superintendent for the coming year, which appropriates about $30,000 more for concrete highways.

The La Crosse, Wisconsin, County Board has outlined its road program for the coming year, deciding on a bond issue of $250,000 for road construction and the building of the first piece of concrete road on the new La Crosse-West Salem highway. The road will be 3 mi. long and will cost $99,000.

Dodge County Wisconsin, recently voted a road bond issue of $5,400,000, according to a correspondent. The issue was carried by a majority of about 900, the City of Beaver Dam voting for the issue by more than three to one. The funds secured are to be used for the construction of a cement concrete road between Fond du Lac and Milwaukee.

More than 25% of the Area of Iowa has agreed to build paved country highways as soon as plans can be drawn and contracts awarded, according to an article in "The Iowa Magazine," the organ of the Greater Iowa Association. This means more motor trucks, it is argued, and it is estimated that within another year there will be 150,000 motor trucks in operation in the state.

MEETINGS

Calendar of Coming Meetings

Jan. 29—National Highway Traffic Association—Annual Convention, International Amphitheater, Chicago, Ill. President, Arthur H. Blanchard, University of Michigan, Ann Arbor, Mich.

Feb. 9-13—American Road Builders' Association—Seventeenth Annual Convention, Tenth American Good Roads Congress and Eleventh Good Roads Show under the auspices of the A. R. B. A., 1st Regiment Armory, Louisville, Ky. Secretary, E. L. Powers, 150 Nassau St., New York, N. Y.

Feb. 18-19—Associated General Contractors of America—Annual Meeting, Chicago, Ill. Secretary, 111 West Washington St., Chicago, Ill.

Feb. 26-28—Southern Appalachian Good Roads Association.—Tenth Annual Meeting, Asheville, N. C. President, A. D. Williams, Parkersburg, W. Va.

Apr. 12-17—United States Good Roads Association—Eighth Annual Convention, Hot Springs, Ark. Director General, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

Apr. 16-17—Bankhead National Highway Association—Fourth Annual Convention, Hot Springs, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

American Road Builders' Association

The circumstances which officials of the American Road Builders' Association feel certain will make the 17th annual convention of that organization at Louisville, Ky., early next month the greatest meeting in the history of the good roads movement include:

First: The vast sums which have been and will be appropriated for road and street construction and maintenance, which a careful computation places at more than a billion dollars for the current year.

Second: The sense of grave responsibility which rests upon everyone connected with highways, officials, engineers and laymen alike, to see that these great appropriations, federal, state, county and municipal, are expended wisely and in the highest interests of the people of the country.

Third: The important developments in road and street construction and maintenance during the past two or three years, especially in the war zone of Europe, and largely by American engineers. These developments cover not only methods, but new appliances and the uses of standard ones; new materials and combinations brought out by technical emergency work at the front.

It is well known that in 1917 war conditions were a great handicap to road construction, and maintenance was reduced to the barest necessities. The result is that roads all over the country, even those of the most approved construction, are sadly in need of repairs. While new construction and adequate maintenance almost stopped, traffic—and especially motor traffic—took great strides forward, with resulting damage to the highways.

All these subjects, and many others, will be discussed at the convention. Among the topics already announced are the following:

Cooperation between Engineers and Contractors in the Execution of Highway Programs.

Modern Plant and Equipment for Highway Construction.

Status of State Aid to Counties, and Its Future Development.

Should the Township and the District Board be Abolished as Road Construction and Maintenance Units?

Is State Supervision of the Construction and Maintenance of All Highways Desirable?

What Part of the Total Cost of Highway Construction and Maintenance Should the Motor Vehicle be Expected to Bear?

Factors which Will Limit Highway Construction during the Coming Season; (a) Car Supply, and What can be Done to Overcome the Shortage? (b) Materials, The Development of Local Supplies and Increasing the Output of Existing Plants. (c) Labor, How Can Supply and Efficiency be Increased?

The Fundamentals of Early Highway Construction; and Are We Neglecting Them?

What are the Fundamentals of Modern Highway Construction?

New Highway Tests Being Made by the Bureau of Public Roads.

For What Grade of Construction Should Federal Aid Funds be Expended?

New Developments in Proper Construction of and Bad Practice which should be Eliminated in Concrete, Brick, Granite and Wood Block, Bituminous Penetration, Bituminous Mixed and Surface Treated Macadam and Gravel Pavements.

PERSONAL MENTION

W. J. Dermott has been appointed city engineer of Radford, Va.

Walter W. Massie has been appointed city engineer of Cranston, R. I.

Orrin W. Head has been appointed superintendent of streets of Concord, N. H.

C. E. Rice has resigned as engineer of the City Planning Commission of Akron, Ohio.

F. E. Phillips has resigned as bridge engineer of the Montana State Highway Commission.

Charles J. Kaltenbach has resigned as bridge engineer of the West Virginia State Highway Commission.

Arthur C. Marble has resigned as city engineer of Lawrence, Mass., and has retired. Mr. Marble has served as city engineer continuously since 1875.

Robert W. Priestman, formerly first assistant city engineer of Lawrence, Mass., has been appointed city engineer to succeed Arthur C. Marble, resigned.

R. M. Morton has been appointed engineer of the Highway Commission of San Diego County, California, and will have charge of road construction under a $2,300,000 bond issue.

Kenneth Evans has been promoted from assistant construction engineer to district engineer of the Division of Highways, Illinois Department of Public Works and Buildings, succeeding Fred Tarrant.

E. H. Davis has been appointed chief engineer of highways in the sixth district, for theGeorgia Highway Department. Mr. Davis was formerly city engineer of Griffin, Ga., and for the past two years has been an inspector with the State Highway Department.

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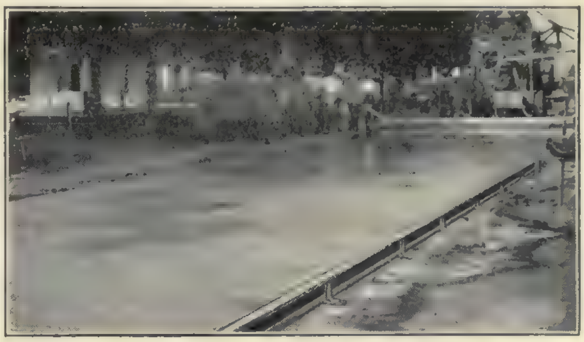

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THE HIGHWAY CONTRACTOR AND ROAD BUILDER

Old Series, Vol. LVIII.
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NEW YORK, JANUARY 28, 1920

Number
4

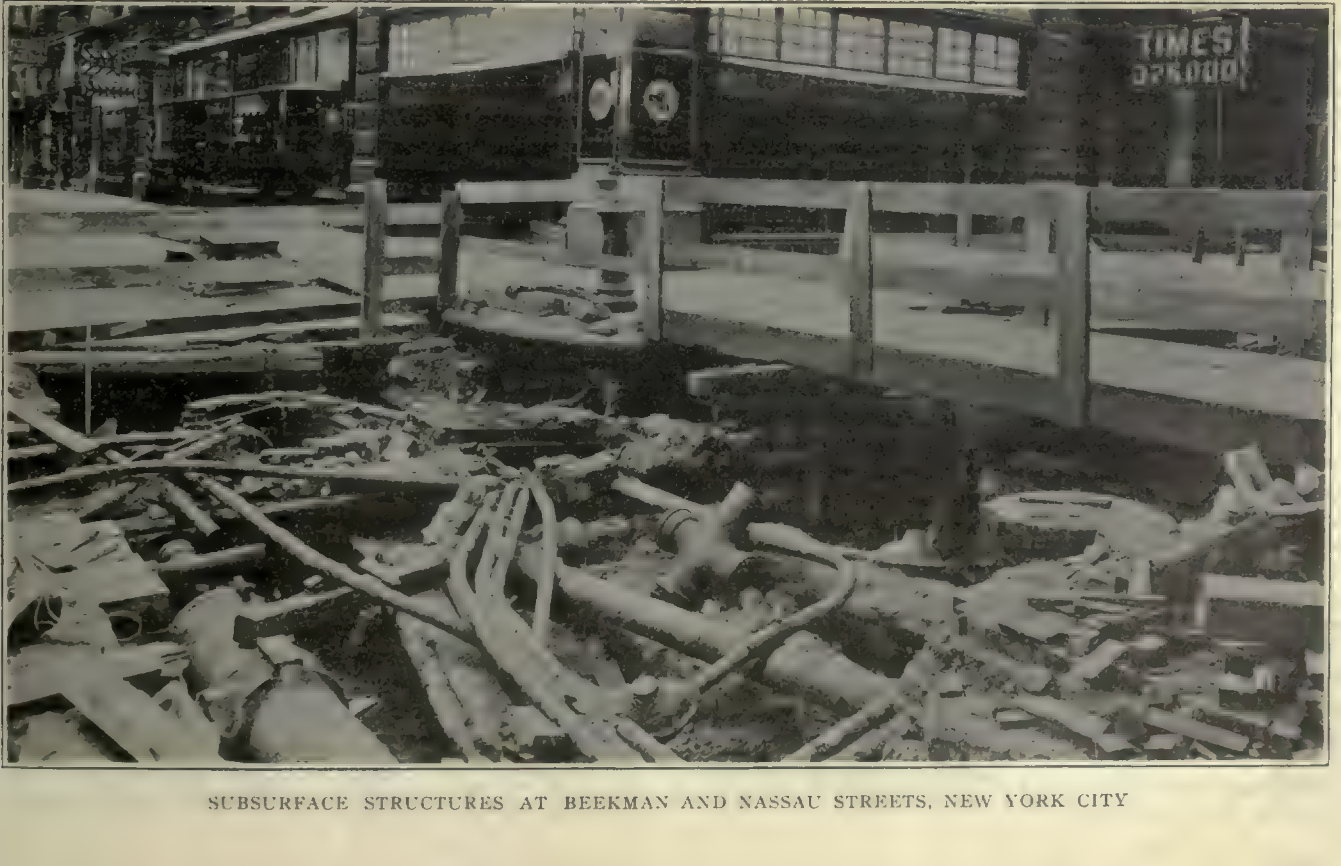
The Repair of Street Openings

Magnitude of Problem of Street Openings—Influence of Subsurface Structures on Pavement Design—Regulation of Openings—Records of Subsurface Conditions—Methods for Different Pavement Types

By WALTER E. ROSENGARTEN, C. E.*

Street openings through pavements create a problem with which city highway officials are constantly confronted. In the City of Philadelphia, during 1917 alone, there were 27,484 openings made in the pavements for water, gas, electricity, telephone and other underground services. Such openings materially shorten the life of some pavements, thus adding a burden to the taxpayers and causing considerable annoyance to the traveling public. Officials charged with the care of city streets frequently receive unjust criticism for allowing the pavement to be continually torn up, and comparisons are made with other cities, especially in foreign countries, where mutilation of the streets is an exception rather than the rule. In America, however, the village of yesterday is the city of today, while in many foreign countries the population has reached a level which is maintained.

Even if the engineer could foresee the requirements of the future in connection with underground structures, it would not always be economical to make adequate provisions in advance. The solution of this problem is becoming increasingly important. Twenty-five years ago, if the water, gas and sewer mains and service connections were first laid, there was little necessity for openings except for occasional repairs, but today the matter has assumed quite a different aspect. The pavements now have buried beneath them, not only the structures mentioned above, but also electric light, telephone, heating and refrigerating lines, pneumatic mail tubes, etc. An-



SUBSURFACE STRUCTURES AT BEEKMAN AND NASSAU STREETS, NEW YORK CITY other factor causing frequent openings in pavement surfaces is rapidly increasing concentration of population which requires larger mains and service connections than were originally installed. The erection of mammoth sky-scrapers often confines within a single city block a population equal to that of a fair sized town. In New York City the Woolworth Building with its 55 stories requires a tremendously greater service from the underground structures than the comparatively minature structure which stood on its site but a few years ago. The Equitable Building alone houses a population of 11,000 within an area of 167x360 ft.

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*Traffic Engineer, The Asphalt Association.

A street in a modern city is no longer merely a vehicular traffic-way, but is now used for many other purposes. In designing a pavement it should always be kept in mind that the main streets of every city have under them a maze of pipes and conduits, generally located with no interrelated system. Faced with the fact that in spite of all precautions, openings are likely to be made in an ever increasing number, city street officials cannot disregard the wisdom of selecting a pavement through which such openings can be made at the least expense, and one in which the replaced section will bond thoroughly with the adjacent pavement, causing little, if any, damage to the street surface and no annoyance to future traffic.

Regulation of Openings

Since street openings are in every sense a troublesome feature they require strict regulation in order that they may be held to a minimum and that those which are absolutely essential may be made in a manner that will be least objecttionable to the traveling public and to the best interests of the future life of the pavement.

Many cities have enacted ordinances which have been found to be very efficient. The principal objects aimed at by these ordinances are: First, the party or corporation who finds it necessary to open the street must be made to protect the traveling public to the fullest possible extent; second, prompt and efficient repair of the street surface must be made; and third the street must be left in as nearly its previous condition as its character permits.

Details of the ordinances used to regulate street openings vary in different cities. Some of the essential features are as follows: Permit must first be obtained from the local authorities by the party desiring to open the street surface and to obtain this, he must prove the absolute need for the opening. If the request is granted, he must sign an agreement, make a deposit to cover expenses to the city and furnish a bond to cover satisfactory repair of the opening. A time limit for the work is set. All structures must be laid more than say 2 ft. below the surface, and plans of the subsurface work encountered and laid are required to be furnished the city showing location, size and type of structure. Excavations must not interfere with or damage existing trees or underground structures and blasting is prohibited when in the proximity of other structures. Streets are not to be unnecessarily obstructed and in no case opened at any one time for more than a specified length, such as 500 ft. Backfilling must be thoroughly tamped in place and suitable material used. Notice must be given to the highway officials in advance so that they may have an inspector on the work during backfilling and repairing. The replaced pavement section must correspond to the original and be so bonded to the adjacent pavement as to cause the least damage to the street surface and annoyance to traffic.

In order to further eliminate service openings in new pavements some cities will not authorize the paving of a street unless water, sewer and gas mains are first laid. Some even require that house connections to each lot be laid within the curb lines. Openings are then prohibited for a period of three to five years, except in an emergency.

Subsurface Records

Destruction of pavements may be further reduced by preparing subsurface maps showing the precise location and character of all structures under the city's pavements.

Too many cities keep no record of their underground structures and know little about their exact location. This is apt to prove a costly mistake, as it is practically impossible to give a location for new lines, where there is no available information upon numerous existing structures. This results in a necessity for digging test holes at frequent intervals and on different streets before a suitable location can be found. Even then, unexpected structures are often encountered which require considerable work to get around. All this causes unnecessary delay in the progress of the work, greater obstruction to the traveling public and larger and more numerous surface openings, all representing heavy expenditures. An exact record of the location, size and type of all underground structures is therefore highly desirable and in the end economical. Philadelphia was one of the first large cities to inaugurate such a system and there exists today an excellent record of its underground structures. These structures are plotted on detail plans to a scale of 20 ft. to the inch. With such plans it is possible for the street official to give locations for new structures or obtain direct access to existing structures. A small charge is made for these plans and also for locating new structures. This results in a saving to the company desiring to make the opening and considerably less mutilation of the street surface. T be of any real value such a system requires constant attention to keep it up to date and all changes or additions to the network of underground piping should be promptly recorded on the plans.

Making the Opening

Street openings for underground service work include not only cuts in the pavement but also the disturbance of the subsoil, frequently for a considerable depth. In order to make the repair as economically as possible the work of excavation should progress in a systematic manner, the paving and foundation materials being removed separately and kept in different piles. These materials, especially in macadam or gravel surfacings, can be used to a considerable extent in making repairs and, for temporary work, can be used exclusively.

In spite of ordinances, permits, bonds, inspection, etc., backfilling and surfacing by plumbers and otheres is frequently poorly done and a better system is that adopted by some cities, which require the permit users to backfill 6 in. or 1 ft. over their structures and then to turn the completion of the fill and repair of the pavement over to the highway repair department. A charge is made to cover the cost of this work. It is then done by an experienced crew which eliminates the necessity of the 6 months' guarantee so frequently required of the party making the opening.

Backfilling Trench

Care in backfilling the trench is as essential as in patching the pavement, since without a firmly compacted subsoil no surface will prove satisfactory. The filling material should be deposited in layers not over 6 in. in depth and thoroughly rammed. The use of mechanical tampers is desirable. If the trench is deep, puddling with water may be found advantageous, but the amount of water used should be reduced as the fill proceeds and for the upper 5 ft. at least no water should be used, but the material should be thoroughly dry tamped. Every soil requires individual treatment, and experience only will indicate the best method of handling to prevent future settlement. Sandy soils compact best by puddling with a limited amount of water, while clayey soils should, as a rule, be dry tamped in layers. For shallow cuts gravel or broken stone filling may be used to advantage but is generally expensive. The object aimed at is to get the fill back in as nearly its original condition as possible. A general rule, which it is well to follow, is to make the re-fill out of the material and compcat it so that, if possible, the condition of the new portion will be similar to that which exists in the surrounding area. A final backfill should never be allowed with frozen material. During winter months a temporary pavement repair is sometimes laid and the final patch not made until settlement has taken place. Some cities will not issue a permit for an opening during the winter months unless in an emergency. The top of the subsoil should be neatly leveled off and thoroughly and uniformly tamped. Material around the edges should be removed so that a smooth, full bed will be presented for the foundation course.

Temporary Patches

When the ground is frozen or the paving gang not ready to complete the patch, a temporary surface should be laid by the gang making the backfill. This temporary surface can generally be made from the old surface materials, if care was used in removing them and keeping them separated from each other and from the subsoil excavation. These materials should be tamped solidly into place in their various layers on the subgrade and the surface made flush with the surrounding pavement. Old macadam, brick or blocks are frequently used for temporary surfacing. Heavy planking can also be be used if it is spiked together and held firmly in place so as not to become dangerous to traffic.

If Portland cement concrete is used in the foundation it will not be possible to lay the surface course until the concrete patch has thoroughly set. Traffic must not be allowed upon fresh concrete while curing, but if the patch is not large and traffic requires the use of that section of the pavement it may be bridged carefully with planking. This is not desirable, however, and wherever possible the patch should be fenced off from traffic. This delay is obviated by the use of an asphaltic concrete of asphalt macadam base.

Temporary patches should not be allowed to remain longer than is absolutely necessary. They not only mar the appearance of the street, but generally cause an unpleasant jolt to passing vehicles and the resulting impact causes a rapidly increasing damage to the surrounding surface.

Foundation Course Repairs

For the final resurfacing of the opening, old materials should be made use of wherever possible, especially in the foundation course. Good results may be obtained by cutting back the foundation of the pavement a few inches in all directions for a distance not less than the depth of the course, thus forming a seat on the undisturbed subgrade for the foundation patch. Some cities require that in repairing over filled-in trenches, the foundation patch shall be made thicker that the original foundation and extend 6 in. beyond the edge of the trench. The foundation patch should in general be of the same material as the original foundation, and the construction methods should conform closely to the specifications under which it was originally laid. The sides of the cuts are made vertical or with a slight batter, and are then cleaned and roughened. The base material, if of gravel, broken stone or an asphaltic concrete, is laid and tamped securely and solidly in place. If the foundation course is of Portland cement concrete, the face of the existing concrete should be dampened and painted with a ⅛-in. layer of neat cement and water, mixed to a stiff consistency in order to secure as good a bond as possible. The surface should be finished off flush with the surrounding foundation and left somewhat rough.

Wearing Surface Patches

The permanent surfacing over the excavations should be made as soon as possible for the reasons previously mentioned and to prevent water from entering and injuring the surrounding pavement.

A customary method of making a surface patch is to lay an excess of material in the hope that traffic and settlement of the fill will in time bring it level with the sourrounding surface. This is an admission by the parties doing the work that they have neglected to properly compact the fill and surfacing. If the work is properly done there should be practically no settlement, and the surface should, therefore, be made flush with the surrounding pavement.

Asphalt Macadam

Openings in asphalt macadam pavement can be readily repaired with ordinary tools and practically all of the original subsoil and foundation material replaced. It is desirable, however, to use new stone in patching the wearing course which should be thoroughly tamped and bonded with the surrounding pavement. A thorough bond may be secured by slightly loosening the surrounding sides of the macadam, which allows the new stone to knit with the old. The construction is carried on as in the case of the original pavement, the asphalt binder being applied from small hand-pouring pots, and compaction being obtained by a heavy roller or thorough hand tamping.

In replacing the wearing surface the aim should be to make the patch exactly like the surrounding pavement. To do this the compaction is an important feature. Traffic has usually made the pavement denser than when originally laid and in order to bring the patch to this same degree of compaction it should receive more rolling or tamping than was given the pavement originally. The amount of material placed in the patch should be carefully guaged as a deficiency will allow the roller to ride on the old pavement, prevent full compaction and result in a depression after traffic has been resumed. If, on the other hand, too much material is used it will project above the surrounding surface when rolled, thus leaving a bump which is almost as undesirable and destructive to the surrounding pavement as the depression caused by an insufficient amount of material. The proper amount of material to be used in making the patch is best controlled by good judgment and practical experience. If the top course is well compacted and the seal coat neatly top-dressed and rolled, the resulting surface blends readily with the old pavement and the patch soon becomes imperceptible.

Concrete

In making an opening through a concrete pavement great care should be taken to prevent injury to the surrounding surface. The use of pneumatic chisels is most satisfactory if they are available. If not, picks and bars can be used but with more difficulty.

When repairing such openings, however, the old pavement should be cut back beyond the edge of the subsoil excavation so as to obtain an undisturbed bearing.

The sides of the opening in the concrete surface should receive especial attention and should be cut perpendicular with the surface for the upper few inches. The lower portion should then be bevelled or stepped so that the patch may act as a wedge, obviating as much as is possible the weakness in any bond between old and new concrete. The faces of the cut should be left rather rough, and just prior to placing the fresh concrete they should be buttered with a thin coat of neat cement paste made by mixing cement and water to a stiff consistency. The surface of the subgrade should be dampened and the new concrete then mixed and placed as in original construction, the surface being finished

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Is State Supervison of Constructing and Maintenance of All Highways Except City Streets Desirable?*

By B. H. PIEPMEIER†

Before this question can be answered intelligently it is necessary to first investigate the general location of the public highways, the purpose for which they were established and the source from which the funds are received to pay for their construction and maintenance.

On account of the nature of our traffic on the public highways, all roads within the boundaries of a state do not serve their purpose in the same way. Some roads accommodate primarily local or community traffic, some intercommunity or county traffic, others intercounty or state traffic, and a few interstate or through traffic. In view of the varied purposes for which our public highways are used, it would not seem to be economical nor desirable for any one political unit to have complete control of their construction and maintenance.

Due to the topographical conditions of a few of our states and portions of other states, the majority of the roads are located to serve primarily villages or community centers. Many of the villages are widely separated and frequently in different counties. The mileage of roads in such instances, compared with the population served or compared with the area tributary thereto, is small. Under these conditions it might be economical or desirable for the state as a unit to have complete control over the construction and maintenance of all roads.

In our agricultural states we have a much different condition. Here we have a very large mileage of roads in comparison with the population or area served. For example, from data published by the U. S. Bureau of Public Roads, Rhode Island has 250 people to every mile of public road or 1¾ mi. to every square mile of area, while in Iowa there are 21 people to every mile of road and about 2 mi. to every square mile of territory. It is very evident that the road problem in the different states is somewhat different, and while state control over all construction and maintenance in some states might be desirable, it would not be in others.

In the agricultural states a very large percentage of the public highways serves traffic which is confined principally to a single community. Such highways are of interest primarily to the people who live within the immediate community; hence, their construction and maintenance should naturally be under the control of local officials.

Inasmuch as all road and bridge construction and maintenance involves engineering principles and skill which can be obtained only by experience, it is advisable to have all local road officials report and be responsible to a competent county commissioner or engineer who should, in turn, be responsible to and under the general supervision of the state department.

In every state there are numbers of highways which should be termed strictly county roads, as a large percentage of the traffic upon them extends from one community to another. Their construction and maintenance might logically come under the control of a county commissioner or engineer, thus making such roads serve as main feeders to a state system.

The residents of every state are increasing their fields of social and commercial activities annually, until, today it is apparent that no local or county unit should be required to bear the burden of the construction and maintenance of all of its roads. Statistics from the Iowa Highway Department show that about 65% of all traffic on our highways in agricultural communities originates within the villages. This would indicate that a very large percentage of our traffic is intercounty—or on roads, the construction and maintenance of which should be under the complete control of the state. Practically every state in the union has realized the necessity and economy of state control over a number of its roads. The exact mileage or percentage of roads it should control is perhaps a debatable question, and will be so long as traffic conditions are changing yearly. It is evident that the thickly populated states should have more roads under their control than the sparsely settled states.

Experience has proved to practically all state road officials that partnership with political subdivisions of the state in the construction and maintenance of road is very unsatisfactory. It seems desirable, therefore, that all roads within the boundaries of each state should be divided equitably among the individual communities, the counties, and the state, and that each unit have the direct responsibility of the construction and maintenance, with such general engineering supervision from the state department as is necessary to control irregularities.

During the past few years there has been considerable argument advanced favoring an independent federal system of roads, with the Federal Government controlling all construction and maintenance. There is no argument against an interstate system of improved highways, as traffic is demanding such a system and all road enthusiasts are looking forward to this realization. In my opinion, the public is not demanding a federal system of roads, with complete federal control, but is demanding a connected system of improved trunk line highways. Any method or plan, therefore, that will secure such a system in the least possible time and in the most economical way will meet with the unanimous approval of the public. There is no question but that the recent federal aid plan has met with approval and has induced many states to take up road construction that would not have done so without this aid. It is reasonable to believe, therefore, that under a federal aid law there will be a greater mileage of improved roads constructed and a trunk line or federal system of roads secured in less time and in a more economical way than under any other plan.

Present conditions would indicate that it would be more desirable to all concerned if the respective states had complete control of all state and federal highways, with such general supervision from the Government on all federal highways as to insure that the roads in each state would connect at the state lines, and to see that the federal money was actually spent on roads which were generally recognized as suitable for the traffic that might be expected. Where the state has a highway department and furnishes any portion of the money in a federal road, its engineering department should be, and generally is, competent to supervise all construction and maintenance work within the boundaries of the state. At least in Illinois, the present plan of federal supervision has proved to be very desirable.

When proper engineering supervision is supplied, it is generally more satisfactory for the political unit which is financing the work to control the construction and maintenance. It is apparent that the local unit as well as the county unit must depend upon direct taxes to finance its

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*Paper presented at the 5th annual meeting of the American Association of State Highway Officials, Louisville, Ky., Dec. 8-11, 1919.

†Construction Engineer, Division of Highways, Illinois Department

GOOD ROADS

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STREET OPENINGS AND SUBSURFACE STRUCTURES

Every engineer of a city street department is thoroughly familiar with the problem of subsurface structures and street openings. Serious everywhere, even where there are comparatively few pipes under the streets and where there are no pavements, the digging up of roadways to make connections or repairs or to lay new pipes or conduits becomes a matter of the greatest concern to the street authorities in the larger cities where the number and variety of subsurface structures are enormously increased and the frequency of openings is proportionately greater.

The first article in this issue should be of particular interest to those who are constantly confronted by the problem, and there are several points made by Mr. Rosengarten that may be briefly noted here.

One of the most interesting questions he raises is the extent to which it is possible and practicable to modify the design of pavements to provide against future disturbances of the surface. As the author points out, this becomes of greater and greater importance as the number and kinds of underground structures multiply and as it becomes necessary to replace existing pipes and conduits with others of larger capacities. How much provision can be made in the design and how far openings should be considered in the selection of wearing surfaces are still open questions.

The matter of regulations for the making of openings and the repair of the surface afterwards is also a troublesome one. Nearly all municipalities have such regulations, but they differ widely in details of character and strictness, though the objects in all cases are the same—to keep the number of openings at the minimum and to insure the replacement of the pavement in the best possible manner. An exhaustive comparative study of the regulations in force in different cities, with careful observations of the results obtained from them, would be of great value.

The desirability of complete records of subsurface conditions hardly should need emphasis. Too few cities have such records, and in many cases it would be difficult if not impossible to make them, except in the case of new streets. A beginning can be made anywhere, however, and by adding to the data from time to time, very valuable information would soon be at hand. It requires no more than a superficial knowledge of the seriousness of the street opening evil to realize how much it could be reduced by means of such records.

TO WHAT EXTENT IS STATE SUPERVISION OVER HIGHWAYS DESIRABLE?

A very interesting question is discussed in the paper by B. H. Piepmeier, of the Illinois Department of Public Works and Buildings, which is printed on other pages of this issue. The title of the paper, which was presented at the recent meeting of the American Association of State Highway Officials, is "Is State Supervision of Construction and Maintenance of All Highways Except City Streets Desirable?"

At first road work in this country was a strictly local matter. As the country developed, the road units became larger and only a comparatively few years ago the limit seemed to have been reached in the county. Then the states began to take up the betterment of the roads, first through aid to the local units and then by assuming the burden of building and maintaining the main through routes. Now, every state exercises supervision over the building and upkeep of certain of the roads within its borders. Just before the outbreak of the World War, after years of effort on the part of advocates of the plan, the Federal Government began to participate in the improvement of the country's highways. Under the Federal Aid Road Law of 1916, this was undertaken through the extending of money aid to the several states, the Government naturally assuming some portion of the control over the work. Now there is a determined effort to secure federal legislation that will provide for the construction of so-called national roads entirely by the Federal Government which, of course, will then exercise supervision over the work.

The history of road betterment work in this country, therefore, shows a decided tendency towards centralization of the administration of the work. Has the limit been reached, or should the control over highway construction and maintenance become still more centralized? How much of it should be vested in the Federal Government, how much in the states and how much in the subdivisions of the states?

Mr. Piepmeier's consideration of the question leads him to the following conclusions:

District and township road work should be under the supervision of local road officials.

County road work shoud be under the direct supervision of county officials.

State and federal road work should be under the direction of state officials.

The state officials should have general engineering supervision over all county, district and township work.

Federal officials should have general engineering supervision over all federal aid work.

This division of authority is not greatly different from the actual conditions, and it would be interesting to know the views of road builders as to its efficacy. Should the powers of the states and of the Federal Government be increased? And to what extent should the state step aside in favor of the Federal Government in the control of work on roads of interstate importance?

Asks Change in New York Road Laws

State Commissioner of Highways Greene Recommends that State be Authorized to Purchase Road Machinery and Materials

In his annual report, Frederick Stuart Greene, State Commissioner of Highways of New York, urges the passage of legislation authorizing the purchase by the state of road machinery and materials used in construction and maintenance as a means of reducing the cost of road work. "Under the present form of contract that the states makes with the highway contractors," Commissioner Greene says, "I figure the state would be saving $750,000 if a change were made in the highway law."

Commissioner Greene also recommends that when the connected system of highways is completed, the state confine its activities to the improvement of through roads leaving the feeders to the main highways to be constructed and maintained by the counties.

Is State Supervision of Construction and Maintenance of All Highway Except City Streets Desirable?

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road improvement; hence, should control the work, providing that proper engineering supervision from the state department is assured.

On account of the large territory which is covered by the average motor vehicle, it seems equitable that all fees derived therefrom should be used exclusively by the state and on intercounty or state roads.

In conclusion, therefore, I would deem it desirable for all road construction and maintenance under existing conditions to be divided as follows:

All district or township road work to be under the direct supervision of local road officials.

All county roads to be under the direct supervision of the county officials, and all state and federal road work under the direct supervision of the state. The Federal Government should have general engineering supervision over federal aid construction, the state general engineering supervision over all county and township or district road construction and maintenance.

Wisconsin Road Work in 1919

Expenditures and Mileages of Different Types of Roads Built in All but Five of the Counties of the State Reviewed in Report of the State Highway Commission

The Wisconsin Highway Commission has completed the compilation of its records of road construction in 1919, with the exception of that in five counties which have not yet sent in their reports. The cost of the work done during the year is estimated at $3,769,853.17 for state aid road construction and $707,346.61 for county aid road work.

The work done, exclusive of federal aid construction was as follows: Grading, 1,089.4 mi.; grading (not surfaced) 667.4 mi., surfacing, on old state aid grading, 168.8 mi.; vitrified brick or stone block pavement, 65.8 mi.; crushed stone macadam, 61.0 mi.; crushed stone macadam, bituminous, 9.71 mi.; crushed gravel macadam, 0.119 mi.; pit-run gravel road, 242.7 mi.; shale, 32.8 mi.; iron ore, 0.8 mi.; disintegrated granite, 57.1 mi.; sand or clay surfacing 34.2 mi. In addition, there is reported the construction of 104 state aid bridges at an estimated cost of $236,368.06 and 585 county aid bridges at an estimated cost of $881,285.00.

Estimates from all the counties but the five referred to above indicate that 488.3 mi. of road surface was treated with bituminous materials, which required 863,000 gal. of tar products and 465,000 gal. of bituminous material of other type.

Urges Reorganization of New Jersey Highway Department

Recommend Drastic Change in Road Law Governor Edwards in Inaugural Message

In his inaugural address on Jan. 20, Governor Edward I Edwards of New Jersey urged the reorganization of the State Highway Commission, by means of legislation abolishing the present board of eight and substituting a commission of three members.

"No board of eight unsalaried members," he said, "can be expected to give the time necessary to promptly and efficiently deal with the intricate details involved in the expenditure of almost $10,000,000 per year; nor can such a board, by meeting once a month, properly dispose of the interlocking business of counties. The Highway Commission should be in constant session. Matters of importance in highway construction, both in regard to state highways and with reference to counties' aid, should be determined without delay. I therefore recommend the abolition of the present State Highway Commission, and in place thereof a board of three commissioners, who should receive adequate compensation. Bills will be submitted to you along the lines of these recommendations, and I firmly believe that in every portion of the state a change in the highway organibation will be welcomed by boards or bodies now having concurrent powers."

Pennsylvania County Officials Urged to Look to Future

State Highway Commissioner Sadler Advises York County Road Officials to Study Needs Before Beginning to Spend Large Bond Issue

Lewis S. Sadler, State Highway Commissioner of Pennsylvania, is actively engaged in meeting and conferring with the commissioners of the various counties of the state in connection with their highway construction programs for this year. Addressing the commissioners of York County, which last summer voted a bond issue of $2,500,000 for road purposes, he called the attention of the delegation to the fact that were it not for the ever increasing truck travel the road construction problem would be a very simple one.

"We might save $20,000 a mile were there no trucks," he said. "But the trucks are here and they will come in increasing numbers because the improvement of roads lessens haulage costs. In arranging your program of construction you must pay particular attention to the heavy haulage question. It is possible in some sections where travel is light that it will not be necessary to put down 18-ft. roads of heavy construction. This must be determined by your engineers. In your program you must think ahead 15 or 20 years.

"Don't go too fast. Don't be haphazard. Study each mile that you propose to build. If you give thought to the future—if you build so that with proper maintenance your roads will be serviceable 365 days of the year, when you have spent $2,500,000 the people of your county will be glad to vote you additional money. It is necessary in the construction of a highway system that you do not permit yourself to be swayed by the desire of individuals. It is necessary that you lay out your system so that the entire country will benefit."

Massachusetts Highway Association

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Announcement

This section of the paper is open to members of the Massachusetts Highway Association for the discussion of matters directly connected with road interests. Members are requested to submit items of interest for use in this column.

Address all communications to GOOD ROADS, P. O. Box 2705, Boston.

President William J. Gannon of the Massachusetts Highway Association, and Superintendent of the Street Department of Fitchburg, died at his home, 21 Francis St., Fitchburg, on Jan. 5, aged 52 years. Death was due to pneumonia.

Devotion to duty is said to have brought on the fatal illness. For a week prior to Christmas, Mr. Gannon remained at the bedside of an aged uncle in Waltham until the uncle died. Mr. Gannon was taken ill soon afterwards and his case grew rapidly worse until the end. His death came as a shock to his many friends in Boston, for there were few persons, either in that city or in Fitchburg, who knew of his serious illness until the end came.

At the inaugural ceremonies of the Fitchburg City Council, resolutions were adopted on his death. At the exercises in Boston a tribute to Mr. Gannon was paid by Mayor Haines in his address.

Mr. Gannon was born in Lewiston, Me., in May, 1867, the son of Michael and Winifred Gannon. His boyhood was spent in Lewiston and he then went to Waltham where he grew to manhood. He became engaged in the construction business and in 1904 was made assistant superintendent of streets in Arlington, continuing that work for four years. From Arlington he went to Medford as street commissioner, remaining until Feb. 1, 1915.

Prior to engaging in municipal work, he had erected many public utlity plants, including water works, at Stoughton, Canton, Rochester, N. H., Winthrop, Me., and the large dams at Lebec, Me., and Waterbury, Vt.

He was president of the Massachusetts Highway Association, a member of the Federation of Good Roads, a member of Fitchburg lodge of Elks and the Holy Name Society of the St. Bernards church.

He leaves three children, Winifred, Marion and William J. Gannon, Jr.

Funeral services were held Wednesday, Jan. 7, at nine o'clock with requiem mass at St. Bernards church at Fitchburg.

The remains were removed to Waltham for interment.

News and Gossip

Representative Martin Hays, of Boston, has introduced a bill in the Legislature to require the state to pay a share of the motor license fees.

Frank E. Farrar has announced his intertion of being a candidate for commissioner of public works of Framingham at the March election.

Mr. Farrar was for some years superintendent of streets in Amherst and before taking up his residence in the latter town, was engaged in the transportation business between Framingham and Boston. He claims fitness and experience sufficient to hold the office. John P. Kyte, who was a public works commissioner just before the outbreak of the war with Germany, and who resigned to supervise concrete construction on fortifications at Sandy Hook, made public his candidacy more than a month ago, being the first in the field.

Mr. Henry V. Macksey, Commissioner of Public Works of Woburn, has been elected President of the New England Water Works Association.

More repairs on Boston streets have been made during the current year than in any 12 months in the history of the city, according to the figures in the office of Commissioner Thomas F. Sullivan. In closing up the activities of this year, Boston is faced with an almost absolute cessation of street improvements unless the mayor's request for an increased tax limit is granted, according to the commissioner.

More than $10,000,000 could be spent on Boston streets during the next few years, according to Col. Sullivan, before Boston would present an entirely modern appearance, but this expenditure will be impossible without a materially increased tax limit, in the opinion of the commissioner. Not only will the Public Works Department appropriation be seriously slashed, but it is even possible that many employees of the Street Repair Department will of necessity be discharged.

Approximately 250,000 sq. yd. of asphalt paving, 18,000 sq. yd. of wood block pavement, 200,000 sq. yd. of granite block, of which more than one-half is on a concrete base, and 200,000 sq. ft. of artificial stone sidewalk were laid during the year.

The Aldermen of the City of Beverly have voted to raise the pay of laborers to $4.00 per day.

The Boston Globe says: "The statement Maine will spend $4,000,000 on good roads during 1920 means that the state will spend $4,000,000 on bad ones." In New Hampshire whatever we spend is on good ones, to make them better. (Keene N. H. Sentinel).

Arthur D. Hill, Corporation Counsel, and Public Works Commissioner Sullivan recently spoke in opposition to the bill to relieve the Boston Elevated Railway from the expense of making street repairs between rails.

Mr. Hill said the city would prefer to have the company pay the bills, even though there might be a continuation of the present situation, which makes the city return the money to the company as a part of its deficit. To pass such legislation, he said, would weaken the city and strengthen the company in future negotiations.

Mr. Sullivan said the bill was based upon the old theory that the traction companies were originally compelled to bear this expense because of the fact that their horses, in hauling cars wore down the street surface between rails.

"We could install paving that would withstand horse wear for 40 years," he said, "but which goes to pieces now in a

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New Hampshire Goods Roads Association

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Hillsborough County has a debt of $135,104.64, according to the report for 1919 just published by Dr. Gustave Lafontaine. The poor showing is due to increased expenses and a tax that is too low. The expense for 1919 was $588,296.26, with receipts at $640,064.93. A copy of the report will be sent to each town in the county.

Mayor Verrette of Manchester has been confined to his house for some time and an effort has been made to have the alderman elect an acting mayor. At a meeting on Jan. 21, action on the matter was postponed by a vote of 7 to 6. The Mayor wrote to the board saying that although he was temporarily disabled he was still able to attend to his official duties at his home. As the mayor has missed only two meetings the majority voted to respect his wishes and postpone action on the matter.

Carpenters in Manchester are now working on a new schedule of $1 per hour for a 44-hour week.

Visitors to Concord will be interested to know that the well known Eagle House is to be remodelled at a cost of $40,000.

It is reported that the State Highway Department may hereafter take over the maintenance of all town roads, cooperating with town authorities.

John E. Colburn, who has recently been elected highway commissioner of Franklin, has reported for duty and assumed direction of the department.

Mr. Colburn is 41 years of age and was for 10 years an employee of the State Highway Department and he also spent two years on U. S. Government road work in New Jersey. He succeeds James C. Nowell who has held the position for several years.

A reorganization of the Portsmouth Public Works Department is expected shortly. At present the superintendent is in charge of the Street and Water Departments and it is proposed to have a separate head for each division.

If Superintendent Cullen, the present head of the department, goes, it is expected that there will be a general shake-up.

Mayor French of Concord has handed out a surprise in securing the election of Orrin W. Head as superintendent of streets at a salary of $2,500. Mr. Head formerly lived in Concord but has recently resided in Connecticut.

At the time Alfred Clark was removed it was expected that the office would be combined with that of city engineer, so this action was entirely unexpected.

Frost has settled in the ground to a depth of over 6 ft., which is deeper than usual. During December temperatures as low as 12 to 14 degrees below zero were common throughout the state.

George P. Winn has been reappointed city engineer of Nashua.

Superintendent of Streets Chapin of Keene has been reappointed.

Maintenance estimates submitted by the various divisions of the State Highway Department aggregate $845,000. This figure covers regular maintenance only and not resurfacing.

It is expected that the state will expend $1,250,000 on the construction of 110 mi. of new highway.

Under federal aid during 1919 the state submitted 86 projects and construction on 72 has been started, giving a total, when completed, of 92 mi. and of this mileage about two-thirds is completed.

Jan. 1, 1919, there were 1,425 mi. of improved roads in New Hampshire and 120 mi. additional were added during this year. Seventy-five per cent. of all improved roads are now under a regular patrol system of maintenance. Average construction costs during 1919 per mile: Gravel $8,000 to $15,000; bituminous macadam, $18,000 to $24,000; modified Topeka $15,000 to 21,000. Rates of labor, etc., during 1919: Laborers, $3.00 to $4.50; foremen, $5.00 to $7.50; teams, $6.00 to $7.50; trucks, $18.00 to $25.00.

The new law regarding the registration of automobiles in New Hampshire is causing considerable delay and inconvenience to automobile owners. The new registration requires the owner of an automobile to make a declaration before the town or city clerk as to the make of the car and the price paid for it. The officials before whom such declaration is made assesses the tax which must be paid before the clerk will issue a permit to the motor vehicle commissioner upon which the automobile can be registered.

The Motor Vehicle Department's inspectors will use discretion in enforcing the new law, but they will not permit a car owner to operate his automobile all winter without a 1920 registration plate. As every owner of a car in this state has been informed by Commissioner Chase regarding the requirements of the new law, it cannot be pleaded that autoists are ignorant of the arrangement under which they must secure their registration permits the coming year.

Inspectors are to give particular attention to roads upon which there are violations of the law which requires all motor cars to approach railroad crossings at a rate of speed not in excess of 10 mi. an hour. It is likely, in view of recent accidents, that a determined effort will be made to curb the reckless motorist who drives his car across railroad crossings at a speed of 20 to 30 mi. an hour.

Drivers of motor cars are showing such a disregard for the law requiring the use of dimming devices on lights that inspectors have been exceedingly busy for several days looking for violators.

Eight inches of light fluffy snow followed by a gale of wind have called for road breaking activities in Laconia. Up to Jan. 16, there had been little sonw and auto traffic has been much in evidence, but now auto traffic is confined to city streets.

Conditions seem to be right for unusual mud conditions in the spring when the frost leaves the ground. The repeated rains before the freezing of the ground, which left it saturated with water, followed by extremely frosty weather with no covering of snow has allowed the frost to penetrate deeply. Sewer and water pipes with 4 ft. of covering have in some cases been frozen.

The city and town authorities of New Hampshire are confronted by a serious dilemma. The demand for public improvement is loud and insistent, but where the money is coming from is the question no one seems to be able to answer. Tax rates and valuations have been jumped 50% or more and the state and county taxes have been almost doubled in a few years. The proposition of issuing bonds for so-called permanent improvements does not seem to meet with favor where it has been suggested.

As it costs the Highway Department about twice as much to do the same work as it did three or four years ago, it would look as if new construction projects could not be generally undertaken.

The cold weather of the last several nights has frozen the water mains between the source of Littleton's water supply and the 3,000,000-gal. reservoir, and the town is without fire protection as a result. Insurance inspectors here found the water pressure reduced from 90 lb. to less than 30 lb. The town has no modern fire apparatus and the New Hampshire Soldiers' Home, with 100 aged veterans, has been unable to obtain water for more than 36 hours.

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JOSEPH WALKER	Albany
S. B. VAN WAGENEN	Rondout

Legislative Committee

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JOHN B. DOWER	Ballston Spa
H. B. HARRISON	Buffalo
JOS. McCORMICK	East Providence, R. I.
W. T. THAYER	Chateaugay
N. E. YOUNG	Union
S. B. VAN WAGENEN	Rondout

Membership Committee

RICHARD HOPKINS, Chairman	Troy
FRED E. ELLIS	Melrose, Mass.
W. A. GREENFIELD	Hornell
C. J. HENDRICKSON	Syracuse
J. F. PADDELFORD	Sherburne

Crusher Run

There are 21 roads advertised for improvement in the letting which will take place at the offices of the New York State Commission of Highways on Friday, Jan. 30.

Maj. Irving V. A. Huie was presented with a gold pencil by his former assistants when he was sworn in as secretary of the State Highway Department succeeding Royal K. Fuller.

Legislation designed to permit the state to purchase road machinery, as a means of reducing the cost of road work to the state, is urged in the annual report of Highway Commissioner Greene.

According to the plans of the State Highawy Department, 10.96 mi. of roads in Albany County are to be reconstructed. The work will include Part 2 of the Albany-Schenectady Road and the River Road.

The employees in the bureau of Auditor S. D. Gilbert of the Highway Department held exercises in the hearing room at Christmas time. There was a large and beautifully decorated Christmas tree and Joseph Sheary acted as Santa Claus.

If sufficient funds are appropriated by the Legislature, 1,054 mi. of roads will be resurfaced and 350 mi. will be reconstructed this year, in addition to the building of 750 mi. of new road, according to an announcement made by State Commissioner of Highways Frederick Stuart Greene.

Fourteen children have petitioned Commissioner Greene to hurry along the completion of the highway between Randall and Morton in Orleans County so that they can continue to attend school. The children are pupils of the Kendall High School and have been forced to stay at home because of the impassable condition of the road.

Fifty-seven of the counties of New York State were represented at a two-day session of the county highway superintendents at Albany on Jan. 13 and 14. Over 100 were in attendance, including committees from county boards of supervisors. Deputy Highway Commissioner Van Ambergh suggested to the county superintendents that they favor changing Section 291 of the automobile law allowing automobile fees to be used for maintaining state roads.

First Deputy Attorney General Cheney has informed Superintendent of Public Works Walsh, in an opinion, that it will be necessary for him to readvertise for bids for the first contract of the Great Western Gateway project between Schenectady and Scotia. The opinion was requested after the lowest two bidders had declined to accept the contract, in order to ascertain whether or not it would be legal to offer the contract to the third bidder, the American Pipe & Construction Co. of Philadelphia, Pa.

John H. Gordon, President of the New York State Road Builders' Association, has issued invitations for an informal reception and dinner to be tendered by the association to all road contractors engaged in work in New York State. The dinner will be at the Hampton Hotel, Albany, N. Y., on the evening of Thursday, Jan. 29, at 6:00 p. m. The speakers will be Frederick Stuart Greene, Commissioner of Highways of New York; James A. Parsons, formerly Attorney General of New York, and Benjamin P. Wheat, of Brackett, Todd, Wheat & Wait, Saratoga Springs, N. Y.

———OOO———

News and Gossip

(Continued from page 41)

very few years, because of the tremendous strain put upon it by the heavy cars.

"Under the law the city must award its contracts to the lowest bidder. The result is that some of our construction is done by men who would not be fit to dig a hole in the street, even if there were no car tracks. The Elevated, bound by no legislative restrictions, can place its construction contracts as it sees fit, and always select a responsible builder because the Elevated has to pay the bill for damages if the construction proves faulty."

In a special report to the Governor, Supervisor of Administration Thomas W. White opposed taking any action on the petition of some 338 employees of state departments for increases in compensation, ranging from 25 to 40%.

The 25% increases would apply to employees receiving less than $1,200.

Supervisor White points out in his report that the employees have received an average increase in compensation of 33% in three years. His reasons for reporting against favorable consideration of the petition at the present time are that an increase of 25 or 40% would work injustice through jumping some employees over others; that they would make no account of merit or demonstrated ability; that salary control is entirely a budgetary matter, and that the work of the supervisor in classifying employees gives the Legislature exact information on which to fix salaries; and that state employment has many benefits which do not accompany private employment, such as a month's vacation with pay, liberal sick leave on approval of heads of departments, permanency of tenure under civil service laws, retirement pensions and working hours of not more than 38 hours of actual service per week.

New England has a new lake. With the closing of the temporary sluiceway in the big new dam across the Housatonic River, the water fills the valley and makes what is said to be the longest lake in southern New England, winding among steep and wooded hills for 10 mi. and varying in width from a quarter mile to a mile and a half. The "Stevenson Dam" ranks among the large engineering enterprises of New England. Its length from bank to bank is 1,200 ft., its height from bedrock to crest is 125 ft. Twenty feet above the crest, supported by arches and piers, runs a concrete highway bridge, with a roadway of 23 ft. replacing the abandoned bridges at Bennet and Zoar. The power plant is at the west end of the bridge whence current for lighting and power purposes will be distributed to Waterbury, New Britan, Naugatuck, Beacon Falls, Seymour, Cheshire, Southington and later to Danbury. This utilization of New England's "white coal" will save vast amounts of the mined product which has so often been the occasion of serious controversy.

C. A. Bingham, who has been for two years city manager of Waltham, has tendered his resignation to take effect on Feb. 1, 1920. Mr. Bingham has been elected city manager of Watertown, N. Y., where his responsibilities will be divided and his salary considerably increased. Waltham has been greatly benefited during Mr. Bingham's term of office, his services having been most efficient.

Mr. Henry F. Beal, the present city engineer and director of public works, has been elected city manager to succeed Mr. Bingham. Mr. Beal is a local man with years of experience in engineering work in and about Waltham.

Richard A. Jones, for many years superintendent of streets of Waltham, has been retired on a pension by the city authorities. Mr. Jones was one of the oldest road builders in term of service in the country and has been one of the leading members of the Massachusetts Highway Association. His many friends wish him long years of health and properity.

No successor has been appointed to fill the position left vacant by Mr. Jones' retirement, as the Street Department has been combined with the Engineering, Water and Sewer Department, under the name of the Department of Public Works. Henry F. Beal who has for the past year and a half been at the head of the Engineering, Water and Sewer Department, is now city engineer and director of Public Works.

The recently created position of assistant to the superintendent in charge of the Street Division has been filled by the appointment of James H. McKenna, Jr., a Waltham man with 14 years' experience in engineering and contracting work. Mr. McKenna will assume his new duties on Feb. 1.

Everett has had a municipal house-cleaning, presided over by the recently installed mayor, Christopher Harrison, and as a result there are 15 vacant chairs in City Hall. The majority of those who formerly occupied them were removed from office, but a few saw what impended and resigned. It is stated that the 15 were active politically during the term of office of Mayor Harrison's predecessor, William E. Weeks.

Brenton W. Vaughan, Superintendent of Streets, Sewers, and Water for the past two years, was removed. He had previously served for two years as the superintendent of the Water Department and for thirteen years had been connected with the Public Works Department.

These office holders resigned on being requested to do so by the Mayor: Fire Commissioners J. H. Vanderhoof, George Faulkner, and George A. Munroe; Daniel J. McCormack and John S. Lindsey, of the Board of Health; Joseph Manley and A. Edward Johnson, registers of voters; Benjamin F. Joy, a trustee of the Shute Memorial Library; J. Blanchard Bohn and Eugene Weber of the Board of Survey; George Baker and Albert E. Timson of the Overseers of the Poor. Rev. Edward J. Dahlin, now of Springfield, and Mrs. Marjorie D. Chisholm resigned as trustees of the library, while Dr. W. L. Howe, Chairman of the Board of Health, whose term expires March 1st, was permitted to remain in office to carry on the work of the board.

After swinging his axe, Mayor Harrison named James F. Monahan to replace Mr. Vaughan as head of the Streets, Sewers and Water. Mr. Monahan served under Mayor Mullin.

The Repair of Street Opening

(Concluded fr m page 37)

off flush with the surrounding pavement. Even more care should be taken in the curing of the patch than was used in the original pavement. The traffic should be barred from it until it has thoroughly hardened.

Wood Block

A wood block pavement is more easily opened than is the concrete pavement. The loss from breakage is comparatively slight. The wood block pavement however has a strong tendency to expand and a cut for a service opening gives an outlet for this internal pressure with a consequent depreciation of the surrounding pavement. For this reason, it is well to require bracing with timbers and screw jacks across the opening in the wood block pavement. Trouble from this internal pressure is likely to be aggravated if wet weather, causing swelling of the blocks, occurs during the period the pavement is open. Before relaying the block the foundation course should be cleaned and the cushion material spread and compacted so as to be in a condition similar to that of the surrounding cushion and its depth carefully regulated so as to bring the upper surfaces of the blocks flush with the undisturbed pavement. A large portion of the old blocks can be used in relaying the patch if they were removed with care. They should first be cleaned of any adhering joint filling materials. If the edges are badly broomed they should not be allowed in the patch. Toothing or breaking joints along the edge of the patch should be insisted upon. As the life of this type of surface depends upon the block being held tightly together, the firm placing of the patch is one of the principal features to be obtained in making a successful repair. If the blocks are not firmly supported on all sides the traffic soon loosens those not so supported and results in the destruction or serious damaging of a considerable area of otherwise good pavement. The filler is placed as in original construction.

The authorities of the Borough of Manhattan, New York City, have recently given as one of their reasons for replacing wood block on lower Broadway with sheet asphalt, the difficulty of making a thoroughly satisfactory repair patch and the necessity for carrying a large number of various sized blocks in stock for such purposes. With proper care, however reasonably good results should be secured.

Brick

In opening a brick pavement little or no loss occurs, where an asphalt joint filler is used, but with a cement grout filler the loss is very material. In the latter case pneumatic or hand chisels are used and the original cut is usually across the toothing, which results in each alternate brick along the edge of the cut being destroyed. Before making the final repair, it is well to remove the brick a slight distance behind the edge of the foundation patch. Each bat should be cut out in order to avoid the straight joint which too frequently mars the patcherd surface of the brick road. Here again the original use of an asphaltic joint filler greatly faciiltates the repair work, as the bricks are much more readily removed than with a cement grout filler and there is no danger of permanently injuring the surrounding pavement joints. Before relaying, the bricks should be well cleaned to obtain good adherence of the new joint filling material. The cushion course is spread and tamped into place and the bricks relaid. When new bricks are required they should be laid together and not scattered among the old bricks, as depth of cushion, to allow for wear on the old bricks, can better be taken care of in this way and a smoother patch results. The grouting material should be mixed and applied as usual, especial care being taken to obtain thorough filling of the joints. If a Portland cement grout is used, traffic should be barred from disturbing the patch for a period of 7 to 10 days, while if an asphaltic filler is used the traffic may be resumed at once.

Stone Block

The conditions met with and the method of relaying patches in stone block pavement are similar to those described in connection with brick pavements. The individual blocks are carefully bedded by the paver in the cushion course and followed by thorough heavy ramming so that they come level with the adjacent surface and all danger of further settling is eliminated. The advantages in opening and also repairing where an asphaltic filler is used, hold equally well in stone block surfacing.

Asphalt Block

In relaying an asphalt block pavement it should be possible to relay most of the old blocks. These should be carefully fitted in place on the prepared, compact sand or mortar bed. If new blocks are required they should be kept together and the bed thickness varied if there is any difference in the depth of the old and new blocks. If the edges of the old blocks have become rounded, the grooves thus formed should be filled with clean, hard, sharp gravel or stone chips. The joints should then be filled with asphaltic cement, the whole surface covered with dry sand and rolled or tamped into place.

Asphaltic Concrete and Sheet Asphalt.

The methods of replacing the surface of openings in asphaltic concrete and sheet asphalt pavement are very similar and may be considered together. It will be found desirable to cut the surface course back somewhat behind the edge of the new foundation and this may best be done just prior to making the patch so that the old pavement will present a clean fresh edge to which the new material will readily bond. If the pavement is old and hard, it will be found desirable to paint the edges sparingly with asphaltic cement. When replacing sheet asphalt a course of binder is laid upon the surface of the foundation and thoroughly tamped. Immediately thereafter, the topping is spread to such depth that when thoroughly tamped and rolled its surface will be level with the surrounding pavement. The asphaltic concrete surface is laid in a single course. The amount to be placed must be carefully judged. If too small, the roller will ride on the old pavement and prevent complete compaction; if too large, the finished patch will project above the surrounding surface. After a little experience it will be possible to judge the correct amount which will come flush with the adjacent pavement when it has received a thorough compaction. A patch more nearly approximating the rest of the pavement will best be made by using an asphaltic cement having a penetration somewhat lower than that used in the original construction. Traffic can be admitted to the surface within a few hours after completion and, if the patch is properly made, it will bond perfectly with the old pavement and soon become invisible.

Summary

When planning the type of surfacing for any street, it is advisable to give particular consideration to its adaptability to repair. Comparing the different pavement surfaces in this connection and with their deterioration from the repair or openings, those having asphalt binders and fillers are superior to others. In opening an asphalt surface there is no injury to the surrounding pavement, as in the rigid types, and traffic works and kneads the asphaltic patch, aiding instead of interfering with a perfect weld. The cost of making the opening is less and practically no delay to traffic is necessary after completion of the underground work.

Asphaltic concrete foundations lend themselves more easily to repair than do rigid foundations, and the wearing surface can be replaced immediately by the same gang making the foundation repair. If the opening is small and heating appliances not readily available, satisfactory repairs can be made very economically by using one of several cold application asphaltic binders.

City highway officials readily appreciate the advantage of being able to open a pavement quickly and cheaply and of being able to close such openings after a minimum delay to traffic. They also appreciate the advantage of being able to make a patch which bonds thoroughly without causing weakness to the adjacent surface nor annoyance to the drivers of vehicles. Asphalt binders and fillers meet these conditions in a more satisfactory manner than any other paving material.

———OOO———

Returned Soldiers' Views on Good Roads were set forth by Gen. Leonard Wood in an article on the American Legion in the January "Metropolitan" as follows: "They have brought home with them many useful ideas, among them an appreciation of the importance of good roads not only from the war standpoint but especially from the peace standpoint. They realize as they never did before how much good roads add to the convenience of the public, how much they mean in the way of increased facilities in marketing products, how much they mean in the development of a country, and they will not be content with the wretched highways which exist in many portions of our own country."

MEETINGS

Calendar of Coming Meetings

Jan. 29—National Highway Traffic Association—Annual Convention, International Amphitheater, Chicago, Ill. President, Arthur H. Blanchard, University of Michigan, Ann Arbor, Mich.

Feb. 9-13—American Road Builders' Association—Seventeenth Annual Convention, Tenth American Good Roads Congress and Eleventh Good Roads Show under the auspices of the A. R. B. A., 1st Regiment Armory, Louisville, Ky. Secretary, E. L. Powers, 150 Nassau St., New York, N. Y.

Feb. 10-12—American Wood-Preservers' Association—Sixteenth annual meeting, Chicago, Ill. Secretary-Treasurer, F. J. Angier, Baltimore & Ohio R. R., Baltimore, Md.

Feb. 18-19—Associated General Contractors of America—Annual Meeting, Chicago, Ill. Secretary, 111 West Washington St., Chicago, Ill.

Feb. 26-28—Southern Appalachian Good Roads Association—Tenth Annual Meeting, Asheville, N. C. President, A. D. Williams, Parkersburg, W. Va.

Apr. 12-17—United States Good Roads Association—Eighth Annual Convention, Hot Springs, Ark. Director General, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

Apr. 16-17—Bankhead National Highway Association—Fourth Annual Convention, Hot Springs, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

Associated General Concractors of America

The annual meeting of the Associated General Contractors of America, and affiliated organizations, previously announced to be held in Chicago, Ill., on Jan. 21 and 22, has been postponed to Feb. 18 and 19.

As previously noted, a two-day conference on construction problems will be held in connection with the meeting. This will be open to all general contractors, whether members of the association or not. At 2 p. m. on Thursday, Feb. 19, there will be an open meeting for members, non-member contractors and the general public. The matters to be discussed at this session include the following: The 1920 Highway Program; State Highway Contracts, and Getting Together with the State Highway Department.

American Wood-Preservers' Association

The sixteenth annual meeting of the American Wood-Preservers' Association will be held at the Hotel Sherman, Chicago, Ill., on Tuesday, Wednesday and Thursday, Feb. 10, 11 and 12.

Among the paper and committee reports scheduled are the following: Tuesday afternoon: Report of Committee No. 6, Preservatives, Chairman, E. B. Fulks, Vice President, American Tar Products Co.; "What Light Creosote Oils Have Done in Wood Preservation," Ernest Bateman. Thursday morning: Report of Committee No. 8, Wood block flooring and paving, Chairman, F. W. Cherrington, Director, Engineering and Sales, Jennison-Wright Co.; Report of Committee No. 4-B, Service records, flooring and paving, Chairman, Walter Buehler, Engineer in Wood Preservation, The Barrett Co.

National Slag Association

The annual meeting of the National Slag Association was held recently at the office of the organization in Cleveland, Ohio. Representatives of the companies producing 90% of the tonnage of commercialized blast furnace slag made in the country were present.

L. A. Beeghley, of the Standard Slag Co., was elected president, C. E. Ireland, of the Birmingham Slag Co., was elected vice president, and H. J. Love was reelected secretary and treasurer.

PERSONAL MENTION

Daniel Miller has been appointed borough engineer of Bangor, Pa.

Frank R. Lanagan has been reappointed city engineer of Albany, N. Y.

Herbert C. Dillard has been appointed borough engineer of Nazareth, Pa.

O. P. Thomas has been reelected borough engineer of Westmont Borough, Cambria County, Pennsylvania.

I. G. Monroe has been made superintendent of streets and sewers of Youngstown, Pa., succeeding Joseph Vogelberger.

Roy M. Stewart, formerly County Engineer of Richland County, Montana, has been appointed city manager of Scobey, Mont.

D. W. Jones has resigned as a district engineer of the New Mexico State Highway Department to become secretary of the Chamber of Commerce of Clovis, N. M.

Lieut. Harold L. Hock, formerly of the Engineers, U. S. A., has returned to his duties in the New York State Department of Highways. Lieutenant Hock was awarded the Croix de Guerre while overseas.

OBITUARY

William J. Gannon, President of the Massachusetts Highway Association and Superintendent of Streets of Fitchburg, Mass., died recently at the age of 52 at his home in Fitchburg. A more extended notice of his death is printed on other pages of this issue.

James Lewis Rake, Vice President and Director of the General Asphalt Company, died after a brief illness at his apartment in the Longacre Hotel, Philadelphia, on January 19, shortly before midnight. Mr. Rake, who has been actively connected with the General Asphalt Company for over 20 years, was born in Reading, Pa., in which city he resided until his death, although spending the greater part of his time in Philadelphia because of his business connections. He was a 32d degree Mason and a Knight Templar; Past Grand Commander of the Sons of Veterans and Treasurer of that body; Past Potentate of the Rajah Temple, Reading, and Past Treasurer of the Reading Lodge, B. P. O. E. He was also a director of the Keystone Slag Company of Reading. Two daughters and his widow survive.

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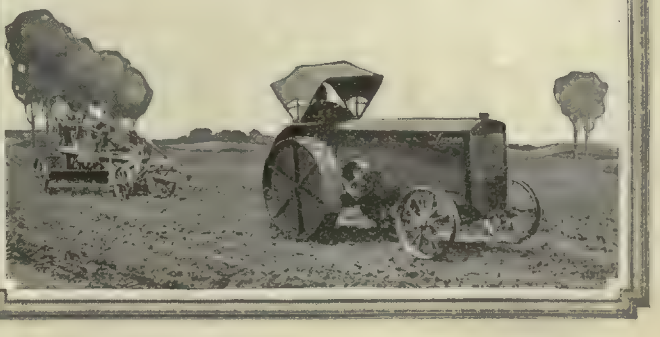

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NEW YORK, FEBRUARY 4, 1920

Number
5

Streets and Roads in and Around Louisville

By T. R. MOSS*

Although Kentucky has often been referred to as the "Dark and Bloody Ground," a study of her history will show that she is not as backward as sometimes pictured. As early as 1810, Kentucky had a highway department and the state furnished aid for the building of roads. Louisville has long been known as the gateway of the South, with about 176 mi. of asphalt, brick, granite block and wood pavement, and about 60 mi. of macadam streets.

Jefferson County, of which Louisville is the county seat, has a road fund of about $500,000 per year, and there are in the county approximately 800 mi. of road, about 500 of which are surfaced with water-bound macadam. Some of them were constructed 100 years ago. About the only high type roads are 11 mi. of Kentucky rock asphalt laid on macadam base, 1 mi. of sheet asphalt and 8 mi. of bituminous concrete on macadam base. The road that has withstood the heaviest traffic in the county is the 18th Street Road, leading out of Louisville, 8 mi. of which is Kentucky rock asphalt on a macadam base.

It was constructed several years ago and during the period of the war carried about 4,200 vehicles per day, most of which were heavy army trucks. The traffic which it withstood would be equal to perhaps 15,000 to 20,000 pleasure automobiles per day. The road is now in perfect condition and the cost of maintenance has been practically nothing.

During the year 1919, about 300 mi. of water-bound macadam road were surfaced treated, using about ⅛ gal. of tar per sq. yd. The county owns a motor-driven pressure distributor and applies the oil with its own crews. All roads treated are given a coat of sharp river sand, using about 40 cu. yd. to the mile of 16 to 18-ft. road. Before surface treating, the holes are all patched with a cold patching material. All of this work is done by the regular county patrol force, and the roads treated are now in fine condition.

Jefferson County was the first county in the state to start the patrol system and too much credit cannot be given the county road engineer, Merritt Drane, his assistant, Harry Cassin, and the county commissioners, P. H. Hunt, Judge J. B. Baskin and Jas. F. Grinstead, and the county judge, Wm. Krieger, for the way in which the patrol system has been brought to a high point of efficiency. It was started in the summer of 1917 when most of the roads were badly in need of repair. The patrolmen immediately started to fill

BROADWAY, LOUISVILLE, KY., LOOKING WEST BETWEEN 2D AND 3D STS.—SHEET ASPHALT.

JEFFERSON ST., LOUISVILLE, KY., LOOKING EAST FROM 7TH ST.—CREOSOTED WOOD BLOCK.

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*Secretary, Louisville Convention and Publicity League.

DRIVEWAY AT THE LOUISVILLE COUNTRY CLUB—SURFACE TREATED MACADAM

THIRD ST., LOUISVILLE—RESIDENCE SECTION—SHEET ASPHALT PAVEMENT

the holes, ditch the roads and clean out the culverts, and the showing made was wonderful. Sixty-two regular road patrolmen are now constantly employed. Each man is assigned a section from 6 to 12 mi. in length, depending upon the work to be done and the importance of the road. The patrolmen furnish their own horses and wagon; the county furnishes all materials and necessary tools. The county with its regular forces delivers material to the patrolmen along the road, using for this purpose 3½-ton motor trucks.

Cold patching material is mixed in the central mixing plant, from which it is distributed, special machinery being provided to promptly load trucks. The county has now under construction a large rock crushing plant which will have a capacity of between 250 and 300 tons a day, and when complete this will be the central plant from which all material will be distributed. Cold patching material will be mixed at this plant, using the screenings instead of pea gravel which is being used at present.

The county recently let a contract for 4.5 mi. of reinforced concrete road, work on which will start in the early spring. It is also planned to let about 10 mi. of Kentucky rock asphalt road this season. In case the present road fund is inadequate to carry out the present program outlined by the county, the people of Louisville and Jefferson County will readily vote an additional tax if the proposition is placed before them. The sentiment for good roads is strong. Jefferson County and the City of Louisville bear about 20% of all the state taxes, yet no complaint has ever been made—because the people of the metropolis want to see the state develop. They realize that it is good business.

The State of Kentucky through its State Highway Department has since 1915 been giving aid to the various counties for the building of roads on what is known as the inter-county seat system. It has been found, however, that this is too large a mileage. Consequently the Commissioner of Public Roads, Joe S. Boggs, has outlined a state highway system which will be presented to the General Assembly for approval and designation. The system embraces about 3,000 mi. of road and has been so designated so as to give each county in the state at least one road. The system will be

MAIN ST. THROUGH LOUISVILLE'S TOBACCO MARKET—GRANITE BLOCK PAVEMENT

18TH ST. ROAD AT LOUISVILLE CITY LIMITS—KENTUCKY ROCK ASPHALT ON MACADAM

A DRIVEWAY IN CHEROKE PARK, LOUISVILLE KY.—OILED MACADAM

BRIDGE ON ROAD LEADING TO LOUISVILLE THROUGH CHEROKEE PARK

constructed with state and federal funds, and so maintained. It is estimated that the system will cost between $75,000,000 and $90,000,000, and is to be completed within a period of ten years. It has not been decided what is the best method of financing the scheme, but it is highly probable that a bond issue will be recommended. Governor Edwin P. Morrow is a great road enthusiast and has let it be known that he intends to give Kentucky a good system of roads while he is governor.

"Combination" Roads in Connecticut

Two Examples of Asphaltic Concrete Wearing Surfaces on Portland Cement Concrete Bases on Heavily Traveled Connecticut Trunk Line

Where state highway officials have experimented with all types of roads, doubtless there are few who have not felt rather proud of well constructed examples of what may be termed the "composite" or "combination" road, consisting of a cement concrete base, and curbs of the same material, and an asphaltic concrete wearing surface.

While engineering opinion may differ as to the precise design, the type, as a rule, makes strong appeal to the road builders and the road users alike. In the first place, these roads represent the impartial use of materials—the stone of the old macadam road, the asphalt of the bituminous road and the Portland cement of the concrete road. Thus the proposition savors more of economic cooperation than competition in the use of road materials. There is also reason to believe that when a road of this type is well built, those responsible for the expenditure involved feel little anxiety as to the results.

The theory that the concrete base will sustain the weight of traffice and that the asphaltic concrete surface will afford the maximum resistance to traffic wear has been demonstrated by experience with the type in many sections of the country. It is the principle applied to street construction in cities and towns. Boulevards, park roads, and suburban highways include notable examples of the type. The combina-

"COMBINATION" ROAD BUILT BY CONNECTICUT HIGHWAY DEPARTMENT ON NAUGATUCK VALLEY ROAD

ANOTHER VIEW OF A "COMBINATION" ROAD ON THE NAUGATUCK VALLEY TRUNK LINE tion road does not make a strong appeal to the manufacturer of road material as do types using his product exclusively, hence the combination road is in a class by itself. It may be described as nobody's road, from a commercial point of view, and everybody's road from the standpoint of economy and durability.

It is a matter for congratulation that this type of road is undergoing test in the State of Connecticut. The Connecticut State Highway Commission is progressive and at the same time conservative, a policy not as incompatible as might seem. The commission has experimented with virtually all types of road, which is a liberal policy; but it has been conservative in not proclaiming any single type of road as superior to all other types before it has been thoroughly tested by time and traffic. For this reason the construction of combination roads in Connecticut bespeaks conscientious effort and careful study of results.

Two views of Connecticut combination roads on the Naugatuck Valley trunk line, a heavy traffic thoroughfare, are shown. At Beacon Falls nearly 3 mi. were constructed in 1919. The pavement is 20 to 21 ft. wide. It has a 6-in. base of 1:3:6: concrete and a Topeka top. The base cost $1.28 per square yard and the top $1.00 per square yard. Another stretch was laid at Seymour, this being identical with the longer road. The cost was the same.

A National Program for Highway Research*

BY ANSON MARSTON†

There is very urgent need for the immediate inauguration of scientific highway research in accordance with a comprehensive national program.

The country is about to spend untold billions of dollars in the construction of paved roads.

Yet there is a very serious lack of the fundamental scientific data which are absolutely essential to the correct design and construction of paved roads. In this respect we are still in the situation of the bridge engineers prior to 1850, who were building bridges without knowing how to compute the stresses on the different members; or, in the situation of the sewerage and drainage engineers, who have learned only within the last few years how to determine the weights which must be carried by sewer pipe and drain tile laid in ditches.

The stresses in pavement slabs due to traffic, the effect of impact and abrasion, of variations in temperature, of non-uniform foundations, the cost of the various elements of highway transportation and the effect upon each element of each item of road improvement, all these, and many other fundamental things, require very extensive scientific experimentation to develop the true foundation principle of really scientific highway engineering.

Existing Agencies for Highway Research in the United States

(a) The American Association of State Highway Officials has already taken measures to coordinate highway research by the various state highways departments by establishing a tests and investigations committee, which is already organized and which has been doing some very good work this year.

Undoubtedly every state highway department is a potential agency for important highway research, and no national program for such research can be made successful without the cooperation of the highway departments.

(b) The United States Bureau of Public Roads: The United States Bureau of Public Roads is undoubtedly spending more money at the present time in direct scientific highway experimentation than any other agency. The work in devising instruments for measuring stresses in pavement slabs and in the subgrades and the actual measurements of the effect of impact, etc., are already of great value.

(c) The Road Laboratories of Engineering Colleges and Engineering Experiment Stations: Many of these laboratories are well equipped and can undoubtedly be enlisted in a highway research program.

As illustrating such work already under way, it may be said that the Iowa Engineering Experiment Station is required by the state law to spend at least $10,000 annually of its funds for road experimentation, and that it is actively engaged in a research on the determination of all elements of cost of highway transportation and the effect upon each element of cost of highway transportation of each element of road improvement; upon which investigation it proposes to spend at least $7,500 per year for a period of several years.

(d) Municipal testing laboratories are available in a number of large cities which could do valuable work.

(e) Manufacturer's research departments and associations should be able to render valuable assistance.

(f) Commercial Laboratories.

(g) Technical Societies: The great national engineering societies can render effective assistance in organizing a national program, and in determining the use to be made of the scientific data to be secured.

(h) Consulting Highway Engineers.

It must be apparent that there is need for coordinating the eight research agencies mentioned above, in order to insure covering the entire field of highway research adequately and without unnecessary duplication of effort.

A Plan for a National Program of Highway Research.

A number of conferences have recently been held by representatives of highway laboratories, of a sectional state highway department association, of the U. S. Bureau of Public Roads, and of the National Research Council, at which a tentative outline plan for a national program of highway research has been evolved.

This tentative plan is to organize six research committees, each to have charge of a definite line of highway research, and each committee to have representatives from all the various agencies to be enlisted, and from all sections of the country.

Each of the eight research agencies in this country, as enumerated above, will of course take active part in organizing the National Program of Highway Research, (otherwise it could not be a success, and the cooperation of the Engineering Division of the National Research Council has been asked.

The National Research Council has been organized by the National Government for the general purpose of organizing and coordinating scientific research of this character. The Engineering Division of the Research Council has acted favorably upon the general plan herein outlined, and the author speaks as a representative of that division, as well as a member of this association, in presenting the plan at this time.

Six Highway Research Committees Recommended

The six highway research committees recommended are as follows:

(1) Committee on the Economic Theory of Highway Improvement.

Purpose: Determination of all elements of cost of highway transportation (both motor vehicle and animal drawn),

(Concluded on page 62)

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*Paper presented at the 5th annual meeting of the American Association of State Highway Officials, Louisville, Ky., Dec. 8-11, 1919.

†Dean, Division of Engineering, Iowa State College.

State Highway Work in Kentucky

Topography—Distribution of Road Building Materials—Early History of Kentucky Road Work—Establishment of State Road Department—Legislation—Present Condition and Future Plans

By JOE S. BOGGS
Commissioner of Public Roads

In order that the reader may have a more comprehensive view of road work in Kentucky, and the conditions which have been encountered in road construction in that state, a brief statement of the topography and a resume of the road work which was done before the recent Department of Public Roads was created is given before entering into the discussion of state aid work under the present system.

In topography, as well as in natural resources, Kentucky differs greatly from most of the other states. In topography, because within the boundaries of few states do engineers encounter mountains such as are found in Kentucky's eastern border and broad level plains like those found in her Mississippi Valley; in natural resources, because seldom in one state do engineers find an abundance of road building material so varied or so well distributed. Few states can boast of an unlimited supply of limestone, gravel and rock asphalt such as is found in this state. Kentucky, although rich in mineral deposits, is essentially an agricultural state, and until recent years the development of her highways has been dependent on the value of the adjacent land for farming. Recently, however, the mineral resources in the poorer farming sections have begun to be developed and with this development has come the construction of new roads. But the development of the natural resources of the state may still be said to be in its infancy and, therefore, road improvement still depends to a large extent upon the value of the land for farming. The highway system of central Kentucky is larger and more improved than that of western Kentucky, while western Kentucky has a much better system of roads than the eastern part of the state.

Topographical conditions have also affected the development of roads in the state since in one locality a surfaced road costs $10,000 or $15,000 a mile, while in another section it would cost $40,000 or $50,000 to construct the same type.

Let us consider the state as divided into sections according to topographical conditions.

On the east, the Blue Ridge Mountains extend from the Ohio River on the north to the Tennessee line on the south, covering a section rich in an only partially developed mineral deposit, and but little suited to farming; a section where coal is abundant but limestone and other road building materials are rarely found; a section traversed by lofty ridges and deep valleys; where road funds are small while the cost of construction ranges from $30,000 to $50,000 a mile; hence a section which has only begun to develop its highway system since the creation of the State Road Department and the development of its mineral wealth.

Just west of this section lies a stretch of hilly country which may be considered as the foot-hills of the Blue Ridge Mountains, a country rich in oil, gas and road building material, but, owing to its topography, a poor farming district, although better suited to agriculture than the more eastern section. Here, with an abundance of road building material available at a low cost, some progress had been made in highway construction before the Road Department was created, but, owing to the limited funds which were available, these counties did not show much progress in highway construction until the General Assembly of 1914 created a state aid road system.

A CEMENT CONCRETE PAVEMENT ON A ROAD IN KENTON COUNTY, KENTUCKY

A BRICK PAVEMENT ON A ROAD IN CAMPBELL COUNTY, KENTUCKY

Contiguous to this section on the west lies the Blue Grass region of Kentucky, a rolling country, almost ideal in topography for the location of highways and a section where limestone, suitable for road construction and easily quarried, is found in almost every hill. This section is one of the richest farming localities in the state and has been under development for more than 125 years. Here macadam and telford roads were built as early as 1810, and at the present time there are few even of the slightly traveled roads which have not been constructed with a hard surface.

West of the Blue Grass and between it and the Mississippi Valley or western Kentucky, as it is generally called, lies a section which, although not so fertile as the Blue Grass, is even richer in road building material. In this section is found not only an unlimited supply of limestone and gravel, but also large deposits of Kentucky Rock Asphalt. Here also the construction of hard-surfaced roads began in the early

HARROWING A GRAVEL ROAD IN UNION COUNTY, KENTUCKY

DRAGGING A GRAVEL ROAD IN McLEAN COUNTY, KENTUCKY

part of the 19th century and most of these counties have continued constructing this type until all the primary roads and a majority of the secondary roads have been surfaced.

In western Kentucky, little limestone is found, but there is an abundance of river and bank gravel suitable for road construction.

While it is rather difficult to obtain suitable lateral drainage, and the number of drainage structures increases the cost of roads, most of the counties of this section have constructed a good system of rural roads.

Little is known of the early history of road building in this state but it is a well established fact that as early as 1810 Kentucky began the construction of hard-surfaced roads. In 1820, the General Assembly apportioned money for road construction and in 1830, $50,000 was appropriated for road work. By 1837, Kentucky had spent $2,500,000 in improving her highways; 343 mi. of macadam had been built and 236 mi. were under construction, making a state road system of 547 mi. In 1837, the state highway force consisted of 13 members—a chief engineer at a salary of $5,000 per annum; two engineers at a salary of $2,000 per annum; one engineer at $1,600, with five assistants at $1,500 and four assistants at $1,100 per annum. As far as the records show, no work was done by the state in highway construction after the Civil War until 1914. From 1860 to 1900, it seems to have been the policy of the state to charter turnpike companies that would construct roads for the privilege of charging toll. There is no record of the number of miles thus constructed, but it is safe to say that it amounted to several thousand miles, for in 1914, when the State Road Department began to assist the counties in road construction it was found that 12,063 mi. of hard-surfaced roads had been built.

About 1900, the public became dissatisfied with the toll system and the counties bought all toll roads. At the same time, the state system was turned over to the different counties. Each county established a road system of its own, and in those counties where the road funds were large enough to warrant it, engineers were secured, but in nearly half of the counties the road fund was so small that the fiscal courts believed it would not be economical to employ an engineer and divided the road fund among the magisterial districts. It was seen after about ten years' trial that if some change were not made in this system, 50% of the money invested in roads would be lost. Therefore, in 1912, the General Assembly created a State Road Department which would advise the county officials and stimulate interest in road construction. In 1914, the department had created so much interest in road work that the General Assembly created a state road system consisting of all roads connecting the county seats of the various counties, and authorized the expenditure of all money derived from the sale of motor licenses on road construction.

Little work was accomplished in 1914, but the department was reorganized and surveys made of 1,036 mi. of road. In 1915 and 1916, contracts were let on practically all the roads surveyed. Under the acts of 1914, counties were authorized to issue bonds for road construction; 28 counties took advantage of this act issuing bonds for $5,755,000 in 1915 and 1916.

(Continued on page 77)

A 30-FOOT GIRDER BRIDGE IN BALLARD COUNTY, KENTUCKY

PATROLMAN TAMPING PATCH ON ROAD IN FRANKLIN COUNTY, KENTUCKY

Economy and Labor Saving Methods Necessary in Highway Work

High Prices and the Scarcity of Labor Present New Conditions in Expenditure of Vast Funds Available---How the Utilization of Trailers and Motor Trucks Helps in Solution of the Problem

By HARRY WILKIN PERRY*

Conditions confronting those who are responsible for highway construction and maintenance are reversed from the pre-war period. In times past insufficient funds were available while labor was plentiful; this year labor is scarce and high priced, but funds available for road work aggregate somewhere between three-quarters of a billion dollars and a round billion. The war suspended road work for two years, during which road funds accumulated. In addition, many states and counties have approved great bond issues for highway construction, so that now, while the need for transportation by highway is greater than at any time before the war, the scarcity of labor threatens to prevent carrying out the road building program and high prices of material and high wages will certainly make the cost of the work very much higher than ever before.

These conditions obviously call for immediate adoption of two fundamental policies—the maximum adoption of labor saving methods, and utmost economy in expenditures of road funds.

Fortunately, the use of labor saving methods results in greater economy by reducing the aggregate amounts paid in wages, although wages paid to the individual man are approximately double the wages paid five or six years ago. At the same time, maximum use of labor saving machinery enables a smaller number of men to build or repair a greater mileage of roads in a given time. Thus there is an important gain to the country both financially and in more rapid extension of the improved transportation facilities so imperatively needed.

Economy in the expenditure of the vast sums of federal, state and county funds now available goes far beyond the employment of labor saving methods. Improved machinery effects a saving primarily only in the one item of wages. Economy extends all along the line, from administration to the adoption of that type of road construction best suited to traffic conditions and which calls for the smallest expenditure over a long period of years. A type of road that may be relatively low in first cost of construction is very likely to cost so much for annual maintenance during the succeeding 10 or 20 years, that it is far less economical than a type of road calling for an initial expenditure 50% greater than the cheaper one.

Present conditions, therefore, call for careful study of the economics of road construction and maintenance by highway commissioners and a high degree of intelligence and conscientious devotion to public interest on the part of highway engineers and contractors. Willingness of the taxpayer to vote liberal funds for road work can be easily killed by an unwise spending of the great sums recently granted.

It is fundamental that roads should be built where they will accommodate the greatest amount of traffic; that the main roads reaching out from important market centers should be improved in continuous stretches and not interrupted by pieces of bad road that absolutely limit the loads that can be hauled; that special attention be given to intercity trunk routes; that the state roads in each state be connected with the state systems in adjoining commonwealths so as to facilitate interstate commerce and travel.

Contracts for road work should be let, as much as possible, for long pieces of highway which will make feasible the use of machinery by contractors. When contracts call for con-

WHITE TRUCK AND TROY TRAILERS OWNED BY FAYETTE COUNTY, KENTUCKY—SEE PAGE 54 FOR DESCRIPTION AND DATA ON WORK struction or repair of ¼-mi. or ½-mi. or 1-mi. sections scattered in different localities, the jobs do not warrant the movement of plants and machinery by the contractor and there is no economy in using such equipment. But when a contract calls for work on a long piece of road, and stone quarries, gravel and sand pits and others sources of materials are reasonably near, crushing plants, steam shovels, elevated pockets, contractor's temporary railways, water supply piping and tractors, trucks and trailers, can be used to great advantage, materially reducing the cost of the work per mile or per yard.

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*General Manager, Trailer Manufacturers' Association of America.

Transportation of materials is one of the chief items in the cost of road work. When materials have to be hauled by rail, they should, of course, be brought as close as possible to the work. If they can be unloaded into elevated pockets at a point a little more distant it may be more economical to discharge at a place where the railroad crosses a ravine or other low place. Here pockets can be constructed with chutes from which the crushed stone, gravel and sand can run directly by gravity into motor trucks and trailers to be hauled to the piece of road under construction.

At gravel pits and sand banks, a steam shovel can load directly into trucks and trailers or into contractor's railway cars. If a contractor's railway is used, it should be elevated at certain points so the cars can be dumped directly into trucks and trailers. In short, every device should be used to avoid shoveling or other human labor. This applies, of course, to road making machinery as well, which will place material on the roadbed evenly and avoid shoveling and raking to level the material preparatory to rolling or smoothing the surface. Concrete roads may be rolled by machinery instead of being floated by hand, and the resulting highway is better and more compact as well as less expensive.

The use of teams and wagons for road work is being displaced rapidly by motor trucks, trailers and tractors. The greatest economy in haulage results when the largest possible quantity is hauled at each trip. Trailers double or triple the capacity of a motor truck and when used in trains of three to six or more with a tractor or traction engine they make it possible to haul 15 to 30 tons more at one time.

Trailers manufactured especially for road work are fitted with dump bodies, some of which are bottom-dump type, others of the end-dump type while still others dump at either side. The side-dump body is most suitable for cut and fill work, while the bottom and end-dump types are best for foundation and surface work.

Both high-speed and slow-speed trailers are used in highway construction and repair. The former are fitted with solid rubber tires and usually one or two are hauled by a motor truck. The slow speed trailer has broad, flat steel tires and is hauled in trains by traction engines or tractors of the caterpillar tread or similar type. The speed of such trains does not exceed 5 or 6 mi. an hour. The trailers are usually of 5 tons, or 3 to 4 cu. yd., capacity. They are made reversible, so they may be coupled together or to the tractor at either end and hauled in either direction with equal facility. A spring drawbar with a bumper drawhead is attached to either end and is swiveled to a draft beam built in the trailer frame. Yokes attached to the drawbar are connected with the steering knuckle arms so that the wheels of each trailer follow in the tracks of the wheels or treads of the towing truck or tractor. Thus the train makes short turns without "cutting corners" or can be turned in a semi-circle of short radius. An automatic lock on each drawbar permits the rear pair of road wheels to be locked so that only the front pair steer when moving forward. In backing, the forward wheels are locked and the rear wheels are used to steer the trailer or train into any desired position. Thus, the trailer or entire train can be backed anywhere—alongside cars or loading platforms, under chutes, into quarries or sand pits or upon runways. If desired, the units in a train can be staggered so that the broad flat steel tires, traveling in different paths, serve to roll the surface of the road.

Such trailers have been in successful use for the past fifteen years for hauling all sorts of road material, including paving brick, asphalt, lumber, logs, etc. Different types of bodies are fitted for various kinds of materials. Trains of six drawn by a traction engine have been used for hauling 30 tons of crushed stone at a trip at Absecon, N. J.; Pontiac, Mich.; in Ramsey Co. Minn.; Springfield, Ill.; Salt Lake, Utah; Shelbyville, Ky.; Muskegon, Mich.; Winona, Minn.; in Port Arthur, Ontario, in Honolulu and various other places in the United States and foreign countries.

The cost of haulage with trailers varies with conditions. Many factors affect such cost; for example, the number of trailers used, whether hauling is done with motor truck, traction engine or tractor, nature of surface over which the outfit operates, length of haul, and ease of getting into and out of loading places. Time is an important element and the easier it is to get into loading position and the quicker the loading operation, the greater is the quantity of material that can be hauled in a day and hence the less the cost per ton-mile.

The train of six trailers used at Winona, Minn., several years ago hauled crushed stone at 5 ct. per ton-mile. Today, owing to high drivers' wages, overhead, etc., the cost would probably be 7 or 8 ct.

In a report dealing with the advantages of modern machinery in road work, Robert W. Davis, County Engineer and Superintendent of Fayette County, Kentucky, stated that some years ago: "Accurate cost data collected under varying conditions established a reasonably accurate ton-mile estimating cost of hauling with teams as varying between 20 and 30 ct. New developments in machinery have, however, placed at the disposal of the road engineer and contractor other methods of hauling, which, under proper conditions, are much more economical than team hauling."

He gave the following examples of costs of one day's hauling with motor truck and trailers in 1915 which costs do not include depreciation or interest on investment:

Feb. 16. Truck alone. Covered 56 miles: hauled 18 tons. Cost for operation $6.73. Gas. 18 gal. at 12 ct; 2 men $4.25; oil 32 ct. Cost per ton 6.6 ct.

Feb. 17. Truck and one trailer. Covered 48 mi. hauled 31.5 tons. Cost for operation, $7.61. Cost per ton-mile 5 ct.

Feb. 18. Truck and two trailers. Covered 48 mi.; hauled 45 tons. Cost for operation $8.73. Cost per ton-mile 4 ct.

You will notice where one trailer was used, 13.5 tons were delivered for 88 ct. and where two trailers were used 27 tons were delivered for $2.00. If the last day's hauling had been by teams at $3.50 per day it would have taken 15 teams costing $52.50 as compared with $8.73 for the truck and trailers; making $43.77 for the county in one day. The trailers used were the Troy truck 4-yd. trailers. Hence we can see that the efficiency of any hauling outfit is in proportion to its ability to deliver material cheaply.

From the report given by Mr. Davis it will be noted that the day's mileage of the truck was reduced only one-seventh when it hauled one or two trailers; that when one trailer was used with the truck 70% more material was hauled, at an increase of only 88 ct., or 13% in total cost and when two trailers were used 150% more material was hauled, at an increase of $1.00 or 15% in cost.

It is evident, therefore, that the ton-mile cost decreases according to the number of trailers that are hauled with a single tractive unit. The number is limited by the nature of the roads or ground over which they operate. A motor truck will haul at least one and often two trailers of equal capacity with the truck itself over hard-surfaced, level roads, but if it has to run over loose earth, dry gravel, sand or crushed stone it may not be able to draw even one trailer. Consequently, it is advisable to use trailers with motor trucks

PEERLESS TRUCK AND SIDE DUMP TROY TRAILER
J. CALVERT SONS CO., DETROIT, MICH.

PACKARD TRUCK AND SIDE DUMP TROY TRAILER
NEW YORK STATE HIGHWAY DEPARTMENT

for road repair work rather than for new road construction. Preferably, trailers for repair work are of the high-speed rubber-tired type which can be operated at 10 to 15 mi. an hour without damage to improved road surfaecs or to the trailers themselves. Here the high speed increases the daily tonnage and is an economy.

For new road building, involving cut and fill work and the placing of foundation or base materials on the sub-base of graded earth, slow-speed, steel-tired trailers are used with traction engines or tractors. These engines and caterpillar tractors are powerful, slow moving machines built particularly for heavy draft purposes and are capable of hauling from three to six trailers in trains over loose earth, sand, gravel or crushed stone. The slow rate of movement is more than offset, in the matter of ton-mile cost, by the greater quantity of material moved at each trip.

Where there are no facilities for quick loading, trailers are used in relays; that is, while some of the trailers are being loaded the truck or tractor is hauling others already loaded to the place on the road where they are to be dumped. If, for any reason, the trailers have to be unloaded by hand or are hauling material that requires considerable time to unload, they can be detached and left for unloading while others already emptied can be hauled back to the loading places. Only a minute or two is required to disconnect one trailer and couple the truck or tractor up to another. If two or more are used in trains, the time is of course increased, but being reversible, the trailers do not have to be turned around and, therefore, much time is saved. This relay system saves waiting time for loading and unloading the trailers, and the truck or tractor is kept on the move a maximum of the working time.

Unfortunately, the legislatures of several states, with the laudable object of protecting the improved highways and insuring the safety and convenience of users thereof, have enacted laws that interfere with the use of equipment which will permit the most economical haulage of material for road work. Thus, New Jersey, Vermont and Washington prohibit the hauling of more than one trailer behind a motor truck or tractor. New Jersey, Michigan and Wisconsin prohibit the use of motor-driven or motor-drawn vehicles fitted with metal tires. In New Jersey, a tractor of the caterpillar tread type may not be driven on any public highway for a distance of more than ¼ mi. Doubtless there are some other states that have laws similar to the foregoing.

The caterpillar tread does not injure any type of road surface. Heavy military tanks with such a tread were driven over asphalt streets in New York and Washington and other cities in the hot weather last summer and no harm was done. Neither can the broad, flat, smooth steel tires used on motor trucks and trailers for road construction work do any damage when these vehicles are operated at speeds not in excess of 6 mi. an hour. But in seeking to preserve the relatively small mileage of paved or hard-surfaced highways, the state-wide blanket laws have an effect of precluding the use of trailer trains and steel-tired slow-speed trucks, tractors or

MACK TRUCK AND TROY TRAILER OWNED BY THE SALT LAKE CITY STREET DEPARTMENT

WHITE TRUCK AND TROY TRAILERS IN USE IN FAYETTE COUNTY, KENTUCKY trailers. As a consequence, the state highway commissioners and the country road commissioners are forced to pay higher contract prices for road work than they otherwise would, since contractors cannot make bids based on the use of such economical equipment.

At the present time the City of Newark desires to use trailers for ash and garbage removal, following the practice in other cities of collecting the waste in single trailers and hauling them to a central point where they are coupled in trains of two or three and hauled some miles out of the city to be dumped. It finds, however, that the New Jersey state law will not permit this economy.

In Vermont, Michigan, Wisconsin and many other states there are large areas where there are no improved roads and where traffic is infrequent, but where there is much quarrying, logging, mining or other heavy hauling to be done. Tractors and slow-speed trailer trains could be used with great advantage and economy in such sections, and no damage would be done to the roads or safety and convenience of traffic threatened by their use, but laws made with a view to the conditions in a more thickly populated section do not take cognizance of conditions in these remote regions. This is due, without doubt, to oversight on the part of legislators and lack of knowledge of the rapid progress being made in haulage methods.

Last summer, when bills were before the Illinois and Michigan Legislatures that would prohibit the towing of more than one trailer by a motor vehicle, as in New Jersey, information properly presented resulted in amendments that now permit trailer trains having an over-all length of 60 and 65 ft. The Massachusetts Legislature passed a similar law last year. This makes possible the hauling of two trailers, but is hardly sufficient to cover the trains of slow-speed trailers used for road work, logging, mining, etc.

If trouble is taken to inform legislators properly and demand is made for suitable amendments to unnecessarily restrictive laws in states where they now exist or where it is proposed to enact similar laws, there is no reason why laws cannot be so framed as to give all necessary protection to improved highways and to the traffic on them without restricting the use of time-saving economical equipment on unimproved roads and in sections where it will not be otherwise objectionable.

Maps of State Highway Systems for Public Use

By M. W. WATSON†

A map to be of real value must be prepared along definite lines to meet the needs of its users. Maps of state highway systems may be divided into several classes, but the two most common divisions are those for the use of non-technical persons and those for the use of engineers. The map that will prove the most beneficial to the greatest number of people is, undoubtedly, the first of these classes.

Maps for General Use

To be of service to the general public a map must not be so designed as to confuse the ordinary user at first glance. Contours or other common engineering symbols are as Greek to the uninitiated. The most outstanding feature of these maps should be the main traveled through routes or state roads. Cities or villages must be shown to make the map of service, but they should not be so conspicuous as to make it appear that each place is the center of the universe, as is sometimes done on advertising maps.

Railroads should be shown, but should be so drawn and designated as to be more of a background than one of the primary features of the map.

Waterways are a necessity a make a map complete and any unusual feature, such as a ford or ferry should be indicated. In mountainous country and in lake regions these topographic features are of considerable value to the traveler as a matter of location, and should be shown. (Fortunately, or unfortunately, as the case may be, Kansas is not disturbed by such things.)

It is possible in some states to show on a state map all the public highways open for travel, but such an undertaking in one of our central western states where every section line is a road, with a few in between for good measure, would produce a map that is of no value to the public, being similar in character to a Chinese puzzle.

It seems rather general practice to show the state or primary roads in large red lines, with the secondary roads shown by narrow red or black lines, and this method is especially desirable for contrast if the other features are in black, blue or green.

By observing the maps of the different states, we are convinced that no great advancement has been made in state road mapping to date. Some are in the blue print stage, while others are elaborately engraved. The scales and general design of the maps are as different as the number of states, so that a weary traveler crossing the state line, if guided on his path by published state maps, would be obliged to rest for a while in some shady spot to familiarize himself with the details. This may be an advantage in some cases, but it most certainly would be a disadvantage if one were trying to make a certain place in a short time.

One fact, however, which stands out, is that practically all of the states have laid out systems of highways and are working towards their completion, and the great majority connect with each other at state lines, so that with the completion of these state systems of highways, a national system will be secured, and it will be located to serve the best interests of the state and its people much better, we believe, than would be the case were the system laid out by a national commission unfamiliar with the conditions in each locality.

A uniformity of maps should be worked out so that over the country some standard as to scale and design would prevail. It might be advisable that some of the governmental mapping departments handle the preparation and completion of the state road maps throughout the Union so as to have uniformity. The writer suggests that a committee of this organization be appointed to formulate a definite plan for uniform maps and to report at the next session.

Technical Maps

The maps of the United States Geological Survey are available for detailed information where they have been completed, but a number of states are not so fortunate as to have these maps for the entire state. Coast and geodetic maps are also of service, especially in states bordering on the lakes or on the coast line.

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*Paper presented at the 5th annual meeting of the American Association of State Highway Officials, Louisville, Ky., Dec. 8-11, 1919.

†State Highway Engineer of Kansas.

Guarantees for Pavements

History of the Pavement Guarantee and Its Development Into a Matter of Maintenance—Evils of the Present System—Present Tendencies

BY MAJ. E. A. KINGSLEY*

The question of guarantees has been a nightmare to the paving engineer for many years. The arguments pro and con are so logical that they are difficult to get away from. Every engineering organization and every contractor's society has taken up the question, fully determined to settle it, and still it is with us.

In the City of Washington, D. C., as far back as 1876, the first American asphalt paving contractor started the ball rolling. To imitate European rock asphalt pavements, De Smedt patented a process of mixing sand and crushed limerock with an American asphaltic cement. Pennsylvania Avenue was the street selected for the first experiment, the District Commissioners with reluctance finally agreeing to it. The promoters thoroughly believed in the success they expected and did achieve, but the commissioners, not so sure, asked for some recourse in case of failure. An agreement was effected that the contractors should guarantee the work to serve successfully as a pavement, and to be free from defects due to materials or workmanship for a period of three years. They did not agree to maintain the pavement but guaranteed to really produce a pavement free from defects.

Such a success was the Pennsylvania Avenue work that the company's business grew rapidly. Other Eastern cities adopted the new form of sheet asphalt pavement. Being new and prices good, the company adopted a general policy of giving a five-year free guarantee on its work. In consequence of this, the "five-year guarantee period" became "standarized" and an established custom.

Like all good things, the success of the first pavements led other contractors to enter the field. The monopoly being held on Trinidad asphalt forced other sources of bitumen supply to be investigated and new asphaltic cements placed on the market. Each new concern, to outdo some one else, offered not especially new merit but a longer guarantee. Some of these ran as high as 15 years.

During the early nineties of the last century, surety companies began to multiply. They resembled in many respects Arkansas and Texas oil companies of the present day. Many were good legitimate concerns, but many more were largely paper. Contractors also multiplied, and more municipalities paved. For a time it almost seemed that surety companies were promoting contractors. The original "guarantee" that the pavement was free from construction defects, or if defects were found that they would be made good, was lost sight of. In the race for business, the "shyster" contractor outbid the legitimate contractor very often with a long term bond, not as a guarantee, but a maintenance proposition. In fact, these guarantees have now come to be generally spoken of and referred to as maintenance bonds or guarantees.

During the years gone by, there was, perhaps, more reason for the municipality expecting a guarantee than there is at the present time. There were few standards for paving materials or of construction. New sources of materials were being discovered and the materials introduced. Improved methods were being evolved for procuring asphalts and these newer productions were fought by the older concerns as being inferior products. Ten years ago even our New York chemical experts were at sea, and it is only within recent years that all of these experts have themselves been convinced of the excellence of the standard asphalts now on the market.

Again, ten or fifteen years ago there were few municipal or highway engineers who had more than a general knowledge of paving materials. Portland cement was coming into general use, but the majority of engineers had but little knowledge of it as a paving material. They were equally at sea on the asphalt question and there were nearly as many colors, shapes, sizes and qualities of paving bricks as there are stars in the sky. To make matters worse the wood block proposition loomed up with nearly as many angles as the brick situation.

The old city or highway engineer had been a division engineer on some railroad at a salary of say $85 per month (up or down, and often down). He knew a few things that he had gotten from his "Folwell on Sewers" and his "Tilson on Roads and Pavements." This was his knowledge of municipal and highway engineering. He was very fortunate if, as city engineer, his salary amounted to as much as $150 per month. The truth is that civil engineering schools neglected the municipal side of the young student's education and taught him railroad and bridge engineering.

With the new materials being offered and the uncertainty of the engineer, because of his lack of knowledge, guarantee bonds became an essential element. Competition grew apace, prices lowered and, as an extra inducement for a contract, long-term bonds were offered. The guarantee became strictly a maintenance bond and certainly tempting. Defects in construction were only incidental, really an excuse for requiring the bond.

Again councilmen and commissioners were not paving experts and the long-term bond appealed to them. This was especially true in the smaller communities. A bond to them meant relief from worries for five, ten or fifteen years. "Suppose contractor A does want 10 ct. per yard more than B," he would say. "Is not A's pavement asphalt and on the same specifications as B's? And A. guarantees to 'maintain his pavement for ten years'." Many times has this argument been used, often for an inferior piece of work. The additional argument would be used that at the end of the period, if conditions had changed and the pavement, because thereof, become bad, the contractor would have to practically renew it.

The writer contends that a guarantee for a period longer than one year on a standard pavement is an increased construction and maintenance expense to the property owner as a first cost, and is at the present day an entirely unnecessary additional cost. From a legal standpoint, perhaps the most valid objection to the present tendency of five or more years guarantee, is the additional first or construction cost to the property owner.

So many engineers have actually adopted the policy of making the guarantee bond a maintenance agreement, that the original meaning "to guarantee" is not considered any more. A bond for five years is literally "to maintain" for five years. For example, San Antonio contractors have been compelled to repair curbing and pavements that have cracked and settled because of settlements and movements of the soil. No defects of any kind in material or workmanship could be found but the contractor either "made good" on maintenance, or was sued. Thus he was cut out of future work, so he usually repaired all work.

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*Former State Highway Engineer of Arkansas; Superintendent of Roads, (Jan. 1918, to June, 1919) Intermediate Section, A. E. F., Nevers, France.

In another instance, due to faulty drainage, an asphalt pavement in an Arkansas city became rather bad near the gutter lines. Water was allowed to run continuously, from springs, over the pavement. The contractor was not to blame. And yet the city engineer forced repeated repairs, "maintenance" by the contractor.

These two examples of many are cited merely to show the trend of interpretations taken by the city engineers as a rule. Contractors are quite well aware of these things and do not overlook them in bidding for work. San Antonio contractors, for instance, now figure the probable amount of maintenance they will have to do during the guarantee period and add that amount to the bid for work. San Antonio is not different from hundreds of other communities. Perhaps it is cheap maintenance.. The writer thinks differently. Certainly it should not be added to the contract price of the pavement as bid.

Figuring on a five year guarantee—in reality maintenance period—and assuming that the community adopts the method to be proposed by the committee on guarantees to the American Road Builders Association, one can safely make the deductions as follows:

1. Surety Company premium on five year bond @ $15.00 per M., assuming contract price is $3.00 per sq. yd., ...	$.045
2. Indemnity to Surety Company say 1 per cent of contract, ...	.030
3. Cash retained by contract, ...	.150
TOTAL COST......	$.225

This figure, 22.5 ct. per square yard, represents no part of the construction cost in the least. Usually an additional bond "for faithful performance of contract" is exacted and in addition a certified bidder's check. These are necessary incidental costs of construction. No allowance is noted in the 22.5 ct. as to this bond and check for they are true construction costs. One may safely assume that the contractor will figure the 15 ct. retained as a maintenance fund, believing it will cover all. He can then only hope for the best. He is quite certain that some method will be devised to use the 15 ct. The writer's observation is that the average small town engineer and council or commission will three times out of four consider the 15 ct. retained a maintenance fund and will find some means of using it on the pavement before the bonded period has elapsed. It is not meant to question the honesty or integrity of engineer or other authority, but the money is on hand, the bond period is about to expire and to use the money for something that has appeared a good thing to do since the pavement was laid, is a strong temptation. Perhaps the contractor has long since died or moved away. At any rate he is not vitally interested in the community and the money really could be used to the community's advantage.

It appears to the writer that ANY period for a guarantee longer than a year becomes automatically a maintenance period. One can hardly conceive of serious defects due to faulty construction or materials, that will not appear within the first year. Certainly a faulty Portland cement concrete will show plainly within a year. A too lean or too rich asphalt mixture will soon give way under traffic and most all surface defects will plainly appear. Foundation troubles may be covered up but if the pavement surface is satisfactorily built and covers foundation weaknesses a year the pavement will without doubt outrun a five-year period.

So many decisions have in the past few years been rendered by various state courts declaring maintenance bonds an improper first cost charge that guarantee bonds of any kind are being omitted in many cases. The "Municipal Journal and Public Works" of July 12, 1919, gave quite an extended and comprehensive review of decisions. Various contractors and engineers too have recalled decisions before the conventions of highway and municipal authorities, repeatedly. A very large percentage of the leading engineers are adopting the lawyers' views.

Again, the long-term period is not necessary because engineers have become more perfected as paving authorities and because the pavements and materials are becoming so well standardized. Experts who were still somewhat in doubt ten years ago no longer waver. The whole situation has cleared. Then, too, the wildcat long-term bond companies have largely gone to their reward and are no longer promoting incompetent, insolvent contractors that they may sell bonds.

The average small town engineer though he may be young and lack mature judgment and experience, is now well educated and has studied more thoroughly municipal and highway engineering. The contractors, too, are as a rule educated men, and equip themselves with much more engineering and expert talent than in the years gone by. Better salaries are now being paid inspectors and a higher class of men are replacing the broken down politicians formerly used for such work. Again, as a general rule, contractors are honest and have a pride in their work. They do not require as close watching as does a pickpocket. Sometimes contractors are tempted to rush work so fast that adequate inspection is well-nigh impossible. In such instances it is far better for both contractor and public to slow down the work. Work done too rapidly to allow for competent inspection is too fast to be safe. It is certainly bad policy to run the risks of poor work by sacrificing inspection for speed, and depending upon a guarantee bond to obtain good results. We civilian construction engineers, who were up against the inefficient methods of the Army engineers, realize what a crime against the world it is to sacrifice judgment, common sense, money and everything else for speed. How many times have we seen thousands and thousands of dollars literally thrown away by Army engineer methods. The paving engineer cannot use the over-worked Army excuse, "the necessity of war demands it" which we were up against, so many times uselessly. Neither are we "up against" the West Point ranking officer. When work is being done too fast to inspect properly, a halt should be called, and the engineer will sustain his inspector.

Contractors, associations, and societies have been trying for years to standarize materials and specifications. Patented pavements, such as the Dunn wire-cut lug brick, Bitoslag, Warrenite-Bitulithic, etc., of course have been standarized and the engineer knows exactly the materials and methods. Others not patented, as Portland cement concrete, standard paving blocks, etc., are being rapidly standarized with the valued assistance of their respective associations. The leading experts from New York, Chicago, Pittsburgh, etc., have rendered valuable free service to our societies in this respect. Contractors and material concerns have aided with their chemists and experts. Leading highway and municipal engineers have given their time and money. And to these must be added the splendid aid and bulletins being given by the Bureau of Public Roads and its able men.

The American Road Builder's Association, the American Society for Municipal Improvements and the American Society for Testing Materials have done excellent work. The Society for Standarizing Paving Specifications, now merged with the American Society for Municipal Improvements, devoted its four years of existence entirely to standardizing specifications. The National Paving Brick Manufacturers Association and the Cement Association have been able assistants. All this effort, for ten years and more, has tended towards uniform specifications, standarized materials and workmanship and a better guarantee than any five or ten

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The Value of Highway Transport Surveys*

BY F. VAN Z. LANE†

To give a concrete picture of the intrinsic wealth of the world, statisticians sometimes resort to the device of tabulating the debts that are carried by the various nations. The World War, in demonstrating the staggering total of debt which the fighting nations could shoulder and still remain economically sound was a revelation of uncounted resources in world wealth, both to the laity and to many business men who had considered themselves well informed.

In the field of highway transport there has been a colossal number of failures; and reports of new transportation companies that have failed are received almost daily. If these debts, the money losses represented by those failures—failures due in a large part to the absence of transport surveys—were the sole reason for the development of such surveys, their value would run into millions.

Insurance against failure is, however, but a small part of the real value of highway transport surveys. Many companies in existence today would, if such investigations were generally resorted to, be able to render greater service to the public and make increasing profits for themselves, and these surveys would undoubtedly establish the desirability of highway transportation lines where as yet such lines have not even been thought of.

The prevalence of failures, paralleling the failures in the automobile industry in its early days, and the number of lines that are operating with a minimum of benefit to themselves and to their public, indicates the most cursory analysis of the territory to be served, or no analysis at all. Many firms are floundering without chart or compass and we should all do all in our power to correct the prevalent opinion that all that is necessary is to buy a motor truck of any make you please and any capacity offered, to start it operating over any road available, during any time of the day or week when the driver feels like it, and to charge any price for his services that may come into his head, just so long as it is lower than any other price charged for transportation between the points in question.

Just so long as the public has this picture of motor transport lines, just so long will the motor truck incompletely realize its effectiveness. That it can be effective has been proven beyond a doubt. As a mechanical device it has demonstrated its dependability and durability and we have enough experience to know that economically it can perform, and must be made to perform more and more its function as part of the transportation system of this country.

We are considering the value of highway transport surveys at a time when many business problems of vital importance are pressing for solution. Living costs are high. Labor is scarce. The railroad car shortage is acute, and the thousand problems of productions are crowding in upon us daily. In all of these problems of our complex business life, there is no factor that affects every phase of economic activity more fundamentally than does transportation. It is, we might say, the very life blood of business and everything that we can do to increase transportation facilities, decrease transportation costs and shorten the time in transit is a vital benefit. Highway transport surveys are, then, not only desirable, but at the present juncture of business conditions, fundamentally necessary.

If we are to survey the field in the broadest and most constructive manner, we must do so in conjunction with a survey of other and longer established means of transportation, especially the steam and electric railways. As an aid to these already existing systems, extending their usefulness in many territories, and even replacing them where such practice proves economically desirable, the motor truck has a tremendous field of usefulness. Just where this usefulness begins and ends, how to cover all territories thoroughly and yet avoid duplication of effort, can only be ascertained by complete and far-reaching surveys.

Traffic experts of the railroads themselves are giving deep thought to the availability of the motor truck in supplementing their present facilities. The present shortage of both track mileage and of freight cars makes the subject a most pressing one for the railroads and a most encouraging one for us who are interested more especially in the automotive branch of transportation.

According to figures from the Interstate Commerce Commission, the total single track mileage of the United States January 1, 1918, was 253,626 mi., and statistics show that the railroad mileage in this country has decreased instead of increased. Last year 689 mi. of line were abandoned. This exceeds by 3 mi. the mileage of new lines built during the year. Furthermore, 1919 was the third year in succession in which reports have shown the mileage abandoned to have exceeded the mileage of new lines built. During the three years from 1917 to 1919, inclusive, operation was abandoned on 3,319 mi. of line and in the same period only 2,386 mi. in extension, branches and new lines were completed and placed in service. Thus, during this period, there has been an actual decrease of 933 mi. in the mileage of the railroads in the United States. It is interesting to note that this tendency to decrease railroad mileage is shown in all three railroad districts, eastern, southern and western.

These figures are taken from "Railway Age," an authority on steam railroad construction and operation. This authority is also responsible for the statement that the greatest freight car surplus ever recorded on the American railroads occurred in March, 1919, when there were 450,000 cars idle; that today there is a shortage of 570,000; that the railroads are, at present, unable to handle all the traffic that is offered to them, and that while the present traffic is unusually heavy, further increases can be expected within the next few years. Records of past performances indicate that the future business cannot be handled without serious shortage of equipment unless a great many additional cars are acquired.

In addition to this tremendous freight car shortage there is also a great shortage in motive power. It is estimated that nearly 8,000 units of 60,000 lb. average tractive effort should be built during the next three years to take care of freight traffic alone.

Director General Walker D. Hines of the American Railroad Administration is quoted in an address before the American Railway Guild on November 18th as saying:

> As well as I can estimate the situation, I believe we are likely to have a large railroad traffic in this country for some time to come. During the war many of the normal demands of the public had to go unsatisfied; there was much building which had to be postponed and many sorts of activities had to remain in abeyance. The opportunity has now come to satisfy those demands, and the building that is beginning to develop and other activities which are now getting back to normal basis create a demand for a very large railroad traffic. So I think the railroads must be prepared to handle a large business for a considerable period.

"Railroad Age" is also responsible for the statement that:

> Insufficient terminal facilities constitute a weak link in the American transportation system. Under Government control the consolidation of forces and facilities was greatly expanded.

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*Paper presented at the annual convention of the National Highway Traffic Association, Chicago, Ill., Jan. 29, 1920.

†Chief Transportation Engineer, Packard Motor Car Co.

> The outlook for a continuance of unification is not propitious, the consensus of opinion being that it is an excellent idea but impossible of realization following return of roads to private management.
>
> Solving of the problem of inadequate terminal facilities, and of the needed coordination of their operation, is imperative.

This great shortage of freight cars and motive power and the insufficiency of terminal facilities, in the face of increased traffic, indicate that the motor truck and the highway must be more extensively used than at present if the business of the nation is to be kept moving in the manner that it should. That it shall be kept moving is absolutely necessary to the life of business and its continued growth.

If we compare, for a moment, the total highway mileage in the country with the railroad mileage, which is as 10 to 1, and if we also consider the flexibility of the motor truck as against rail operation and that one method of transport is quite as dependable as the other, we can begin to realize the work that highway transport should be made to do.

In this connection it is also interesting to note that the freight car makes an average of but 15 mi. a day and that the average tons per loaded car are less than 28. From this we can get an even better picture of how the motor truck can greatly assist the railroads in moving the traffic of the country.

I don't believe that motor trucks should compete with the railroads, as a general proposition, but I do believe that they should be operated when it can be shown that it is more economical for such operation to take place. By economic I mean where the motor truck, as compared with the railroad, can cut down the time of delivery, make such delivery more frequently and at less cost.

When we realize the number of absolute business geniuses who have devoted their lives to railroad transportation problems, and then realize the extent to which highway transport can be employed to supplement and extend the usefulness of these same lines, we have a prospect before us broad enough to satisfy the most ambitious and those with the highest ideals.

After the steam railroads, in considering the motor truck as an aid to existing means of transportion, a highway transport survey would concern itself with the relations of highway transport to electric railway service.

The electric railway situation in the cities and surburban and rural districts of this country is in a very chaotic condition. Many lines have been abandoned; others have been thrown into the hands of receivers; fares have been raised and service has been curtailed all to the disadvantage of the traveling public. I am quite sure that local surveys would frequently indicate that highway transport in the form of motor buses can very greatly relieve this situation.

In a recent issue of the "Electric Railway Journal," an authority on the electric railway industry, the assistant to the president of the railroad company in one of our large cities, in discussing how buses are run in that city in connection with the railway, makes the following statement:

> It is believed the motor bus is here to stay, that its use is going to increase largely and that the logical people to handle and develop it are those who have been trained and have received their experience in street railway operation. It behooves the progressive street railway manager to study the motor bus situation and be prepared to meet it and to use it as an auxiliary to his other operations, rather than have to fight it as a competitor.

The buses in the city of Newark, N. J., a city of 400,000 people, carried 16,000,000 passengers the first half of last year and statistics from several other cities indicate that the bus surely is here to stay.

Yet many operations of this kind have been inaugurated and have failed, or are not operating to the best advantage of the general public. The proper kind of survey will, in most instances, save such failures and cause the successful operators to give even better service and be more efficient and point the way to where new operations are desirable and how to successfully inaugurate them.

No general survey of the field of highway transport would be complete that left out of account its use in districts now without rail facilities. Mines, forests and quarries situated in remote sections are generally exploited by big organizations with financial backing sufficient to solve their own transportation problems, and many of them are finding their solution in the use of motor trucks.

In farming sections, however, where the productive unit is comparatively small, there has not been the same incentive for big business to make a thorough survey of conditions and where there is a tremendous field of opportunity.

The same factors that affect the big manufacturing institutions in the industrial centers—rising costs, labor shortage and lack of adequate transportation facilities—affect equally the producers in the fields. The situation is serious and at any time may become acute. Every help that can be given to the producer of foodstuffs adds to the well-being of the nation.

Some one in authority has said that if the labor situation on the farms is not relieved in some manner, in a short time, for a certain period, some of those in commercial and industrial life will have to assist the farmer in harvesting his crops if we are to obtain a sufficient amount of farm products. One answer to this, and probably the most logical one, is to so arrange the farmer's transportation that it will be unnecessary for him to take labor from his farm to perform this function as heretofore, and a proper use of the motor truck and the highway will go a long way toward meeting this problem.

Our present system of food distribution is probably the most expensive the world has ever known. That the motor truck can reduce such costs has been proven absolutely by the Government, itself. The saving effected by Assistant Postmaster General Blakslee in the actual demonstration of highway transport lines from some of the rural districts in Pennsylvania to Philadelphia and Washington are significant, to say the least, On an exhibit recently shown the Committee on Post Roads and Postal Servce, of the House of Representatives, by Mr. Blakslee, of 41 trips made by the motor vehicle truck routes, a saving of $6,612 to the consumer was the result. Added to this was the time saved to the farmers who had their produce taken from their gates to the market and who were thus enabled to continue performing actual work on their farms. Just previous to the inauguration of these routes by the Post Office Department, I helped make a survey of part of this district which indicated the saving later affected. Yet the people there did not realize how materially they could be assisted until this investigation had been made.

Speaking of railroads, I was reminded a minute ago of a story which, no doubt, many of you have heard of the sturdy freight engine which was pulling a long line of freight cars up an eastern rise of the Great Divide. As it struggled with its burden up the long slope it encouraged itself by repeating: "I think I can, I think I can, I think I can."

As it approached the top it puffed and snorted and caught its breath and gasped once more: "I—think—I—can."

Then as it careened merrily down the western slope it chuckled to itself. "I thought I could. I thought I could. I thought I could."

For your relief and edification I might say that in following my thought you have already reached the peak and if you can hold out a few minutes more you will be able to join the chorus with the engine and say, "I thought I could. I thought I could, I thought I could."

We have traveled far in considering transportation surveys

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GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

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Vol. XVIV FEBRUARY 4, 1920 No. 5

THE A. R. B. A. CONVENTION

Next week at Louisville will be held what the officials of the American Road Builders' Association expect to be one of the most successful conventions ever held by that organization.

That this expectation will be realized seems entirely reasonable. For the past few years road work has been almost at a standstill; now it has started up again and gives promise of going forward at an unprecedented rate. There probably never was a time when so much interest was being taken in road work as is being taken at present; certainly there never was a time when so much money was available for doing road work. And there have seldom, if ever, been so many problems to be met and solved by road builders.

All these factors combine to make the Louisville meeting especially timely and of special interest. The scope and character of the technical sessions are such that the papers and discussions thoroughly cover all phases of highway work, from the standpoints of officials, engineers and contractors. The Louisville program—printed elsewhere in this issue—is particularly broad and inclusive, treating of all the multitude of questions now engaging the attention of those who build the nation's highways.

Another factor that should be taken into account is the exhibition of road machinery, equipment and materials that will be held in connection with the convention. For the past two years the large and varied displays that have differentiated the A. R. B. A. conventions from other road meetings have been omitted, their place being taken by the less elaborate and complete displays that it was possible to make in hotels. This course was followed because of the war con- year, however, all the former restrictions have been removed and it is expected that the Louisville show will equal—perhaps exceed—the former shows in number and variety of exhibits. This is especially imporatnt, too, because of the enhanced interest in labor saving machinery induced by the scarcity and high cost of manual labor.

PAVEMENT GUARANTEES

To most engineers the article on "Guarantees for Pavements," by Maj. Kingsley, which is printed on other pages of this issue, will be of especial interest. It should also appeal very strongly to road contractors.

The matter has been very freely discussed at road meetings and in the technical press, and there is a very general feeling that present conditions are not at all satisfactory. Various remedies have been proposed and objections to most of them have been made. It is likely, however, that some change in practice will come some time in the future. In the meantime, the matter may well be further considered by both engineers and contractors, especially by the latter, since they are the chief sufferers from the injustices of present practice.

MAPS OF STATE HIGHWAY SYSTEMS

Plain, simple maps of state highway systems would be of very real value to motorists—if motorists could be educated to use them. Most laymen, however, do not naturally turn to a map for information; they prefer to make inquiries of people along the road or to secure information as to routes and road conditions from the various sources of such information that have been created to serve the motoring public.

One reason for this is probably the fact that comparatively little effort has been made to prepare maps that are suitable for general use. As stated in the paper by State Highway Engineer Watson of Kansas, which is printed elsewhere in this issue, the common symbols used by engineers on maps are unintelligible to the average non-technical user. But it is quite possible to draw maps that contain only the essential features and that, with a little clear explanatory matter, can be used by anyone. What should be shown on such maps and how it should be indicated are described in some detail in the paper to which reference has been made.

If state highway departments would put out maps of the right kind and urge their use upon automobilists they would be doing a real service. Many of them already do, but the number might well be larger.

MACHINERY AS A SOLUTION OF SOME OF THE ROAD BUILDER'S PROBLEMS

The two problems that at the present writing promise to give the road builder the most trouble during the coming construction season are those of labor and material supply. In fact, it seems likely now that the difficulty of obtaining men and materials will seriously interfere with carrying out the very extensive program that has been prepared.

Under these circumstances, it is natural to expect that machinery will be used more extensively than ever before. There are many machines on the market that will materially reduce the number of laborers required to do a given piece of work, and by the use of trucks, trailers and other plant, the obtaining of materials can be facilitated in many cases, since the lack of transportation seems likely to be the chief obstacle in the way of getting materials to the work.

This latter phase of the problem is very thoroughly covered in an article on the use of trailers which is printed on other pages. It is entitled "Economy and Labor Saving Methods Necessary in Highway Work," and it contains much of importance besides the matter on the use of trailers with trucks and tractors.

Cooperation Between Engineers and Contractors in the Execution of Highway Programs

BY R. A. MEEKER*

The best results in highway design and construction are obtained when the engineer and the contractor work in conjunction. The engineer being in possession of the technical knowledge, and having in mind the ultimate object to be obtained, prepares his preliminary plans; then if he is wise, he will discuss with the contractor, who is familiar with the practical details, the best, the cheapest, and quickest method of reaching the desired result. It has been well and truly said that no one man can know it all; hence a full, free and frank discussion will benefit both parties. For example, the engineer, wishes to use the local material on the job. This material while of the same general character as the standard material usually employed, has certain peculiarities that demand a method of handling slightly different from that commonly used. With these the contractor is often more familiar than the engineer and consequently is able to offer valuable suggestions, that will frequently save both time and money. The constant changes and improvement in road machinery are generally more familiar to the contractor than to the engineer, because the former is a prospective customer of the manufacturer and is consequently kept fully informed of every labor saving device as soon as it is put on the market. If the engineer possessed this information he could so frame his specifications that the new and quicker methods of handling the material would be called for, thereby saving much valuable time.

Frequently during the progress of the work, some better and easier method of doing a specified piece of work suggests itself to the contractor. If the engineer is in touch with the contractor, he is quickly placed in possession of the new method and proceeds to put it in use on some other job that is lagging.

The greater the number of jobs under way, the greater the immediate benefit. It often happens that the contractor overlooks certain clauses that the engineer has placed in the specifications; these clauses frequently modify and again clarify a section that taken alone is obscure. If the contractor is in touch with the engineer, he at once takes the matter up with him and the exact meaning is made clear, thereby saving time, temper and money.

At present there is another very important matter demanding the engineer's consideration, namely, how large a contract it is possible for one contractor to complete in one road building season. This the contractor is in a better position to answer than anyone else. Within reasonable limits the larger the contract, the more cheaply it can be executed. If the engineer consults with a number of contractors and learns the size of the equipment owned or controlled by each, he can divide his proposed work into the largest practical units, thereby both speeding his construction and reducing the cost of the same.

In brief, much is to be gained by both parties through cooperation. These facts are recognized by the leading road engineers, and to a certain extent, by the state and county officials. The change in sentiment in the past ten years is very marked, due to the fact that both the engineer and the official are learning to regard the contractor as a fellow worker.

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*Consulting Highway Engineer; Former State Highway Engineer of New Jersey.

A National Program for Highway Research

(Concluded from page 50)

and the effect upon each cost element of highway improvement (improved surface, grade reduction, elimination of rise and fall, etc.) to enable reliable and scientific determination of the sums which could be economically expended for specific highway improvements.

(2) Committee on Structural Designs of Roads.

Purpose: Experimental determination of stresses, strains, and behavior of impact and abrasion, in actual roadways under traffic, including also the effect of temperature variations, freezing and thawing, non-uniform subgrades and other factors, in order to establish reliable scientific theory for the strucural design of roads.

(3) Committee on Properties of Road Material.

Purpose: To investigate the properties of road materials and their combinations, including devising and standardizing tests.

(4) Committee on Methods of Road Construction.

Purpose: To collect and disseminate information on the various methods of securing efficient results in road construction, under various conditions and in the different parts of the country.

(5) Committee on Maintenance and Designs.

Purpose: To collect and disseminate information on the various maintenance methods and the principles of maintenance designs which are found to give the best results under different conditions in the various sections of the country.

(6) Committee on Highway Bridge and Culvert Research.

Purpose: Investigation of the waterways required for different classes of culvert and drainage areas. Investigation of the distribution of wheel loads over bridge floors. Other unsolved problems of highway culverts and bridges.

Relations of the American Association of State Highway Officials to a National Program for Higwhay Research

The author believes that the Executive Committee and the Tests and Investigations Committee of the American Association of State Highwty Officials should now proceed to cooperate actively in organizing and making a success of some national program of highway research, such as outlined above, or some other practicable program in which all the research agencies can be enlisted. The organization of each committee should be worked out in such a way as to provide adequately for representation from the state highway departments of the country, as determined by the Executive or the Tests and Investigations Committee. There are very many ways in which the many state highway departments can cooperate in the actual researches. In fact, many of the researches cannot be made successfully without the active cooperation of the state highway departments. There are many data needed which can be collected best by the highway departments. Our Executive and Tests and Investigations Committees should (and I think they do now), have full authority to act for us in cooperating in a national program for highway research.

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Contracts Totaling $1,021,681. 53 for the construction and resurfacing of roads in Ohio have been recently let, according to Highway Commissioner Taylor.

The American Road Builders' Association and the Louisville Convention

The nation has turned its activities from the vigorous prosecution of the war and now is engaged in fitting itself to enter upon an age of prosperity and progress unprecedented in history. Our shipbuilders are constructing a great merchant marine, our banks are extending their service to foreign countries and our manufacturers are enlarging their plants and rapidly increasing production to meet both the domestic and export demand for all commodities. We are living in an age of reconstruction and construction—repairing the things neglected during the war and planning greater projects than ever before. In accordance with the spirit of advancement comes increased activity and increased interest in better highways, for we have learned that "Roads rule the world—not kings, nor congresses, not courts nor constables, not ships nor soldiers." The American people have become educated to the fact that the progress of the country can advance no more rapidly than does its system of highways, and accordingly more than one billion dollars have been appropriated and are available for use in the coming year.

In view of the great interest in better roads and the large appropriations made, it becomes readily evident that the seventeenth annual convention of the American Road Builders' Association which will be held at Louisville, Ky., on February 9, 10, 11, 12 and 13, 1920 will be the most important and will attract more wide-spread interest than any meeting yet held. This association is the oldest and largest of its kind in this country and is national in scope, including many thousands of highway and street officials, engineers and contractors and manufacturers of and dealers in road building equipment and materials. Also included in its membership are many who, while not actively engaged in highway work, are interested in the matter and frequently indirectly connected with it.

At the time of the organization of the association in 1902 highway engineering was still in its infancy and this organization and the methods of road construction advanced hand in hand and the American Road Builders' Association has been perhaps the most important factor in the advancement of the science of road building. The first convention of the body, then known as the American Road Makers, was held in Detroit, Mich., on Feb. 13 and 14, 1903, and was a pronounced success. The value of getting together men engaged in road making from all parts of the country and exchanging ideas and relating their experiences under various conditions became readily apparent and annual conventions have been held since that time. The next convention was held at Hartford, Conn., on Feb. 10 and 11, 1904, with the delegates in attendance totaling 1,129 and from that time the annual meeting became an important event not only in the association's activities but also in general road building circles. Because of the great success of the meeting in Hartford, another day was added to the next convention which was held in Port Huron, Mich., on August 29, 30 and 31, 1905.

At the sixth convention held in Columbus, O., on Oct.

GEO. P. COLEMAN
President

J. A. DUCHASTEL
Vice President
Northeastern District

R. C. TERRELL
Vice President
Central District

S. BENSON
Vice President
Western District

E. L. POWERS
Secretary

EXECUTIVE OFFICERS
OF THE
American Road Builders' Association
1919—1920

J. H. MACDONALD
Treasurer

26, 27, 28 and 29, 1909, the meeting was lengthened to four days and a new feature introduced in the form of an exihibition of road machinery and materials held in conjunction with the meeting. There were about 40 exhibitors at this convention and the innovation met with instant approval and has been continued ever since, having been omitted but once, in 1915, when a joint meeting with the American Highway Association was held in Oakland, Cal., at the time of the Panama-Pacific International Exposition.

W. A. McLean*

Geo. W. Tillson*

A. W. Dean*

H. E. Breed*

Samuel Hill

J. Frank Smith

C. M. Upham

C. J. Bennett

Col. Wm. D. Sohier

Lt. Col. W. D. Uhler

Lt. Col. H. L. Bowlby

Wm. H. Connell

DIRECTORS—AMERICAN ROAD BUILDERS' ASSOCIATION (*Past Presidents).

During the period from the inception of the association to about 1910 the necessity and importance of constructing and maintaining good roads was fast becoming realized throughout the country, due no doubt in a large measure to the growing number of pleasure and commercial automobiles coming upon the nation's highways. The old methods, theories and ideas of materials of construction underwent a revolution and what was once good road building was unable to meet the new problems which our highway engineers faced. However, the principles of road building became better understood by meeting the new conditions and the science made great progress. Not only was there a development in the technical and practical field of road building but also there was a change in public sentiment. Heretofore the inhabitants of the rural sections were about the only part of the population which concerned itself in road matters, but with the advent of the automobile and the consequent travel of people of the city over the highways, interest was stimulated where it had not existed and the nation en masse waxed eager for better roads. Naturally the American Road Makers' scope of endeavor enlarged, its membership multiplied and its influence was felt in every quarter; and the annual convention became the most important event among road builders. To keep up with the march of progress the association was chartered in 1910, without capital, under the laws of the State of New York and its name was changed to the American Road Builders' Association.

A. H. Blanchard* H. K. Bishop M. F. Bramley F. E. Everett

Lt. Col. W. W. Crosby R. A. Meeker Frank F. Rogers, O. C. Rollman

Joseph W. Hunter Nelson P. Lewis H. G. Shirley Wm. R. Smith

DIRECTORS—AMERICAN ROAD BUILDERS' ASSOCIATION (*Past Presidents).

The seventh annual convention was held at Indianapolis, Ind., on Dec. 6, 7, 8 and 9, 1910, with over 1,400 members in attendance and 45 exhibitors displaying their goods. The eighth annual convention and the third exhibition of machinery, equipment and materials was held at Rochester, N. Y., on Nov. 14, 15, 16 and 17, 1911, with ten more exhibitors than the previous exhibition and with a slightly greater attendance of members. At this meeting the method of proceedure in conducting the meetings was altered, each session being devoted to the consideration of some particular topic which was introduced by a formal paper. This introductory paper was followed by two formal discussions and by a general discussion open to the convention.

In 1914 the association met at Chicago, Ill., on Dec. 14 to 18, with the attendance over 3,500 members and the exhibitors numbering 116. In 1915, as mentioned above, the American Road Builders' Association joined with the American Highway Association and several local road organizations in holding a joint convention at Oakland, Cal., during the Panama-Pacific International Exposition. In 1918 the fifteenth annual convention was held in St. Louis, Mo., on Feb. 4, 5, 6 and 7. Because of the war conditions obtaining it was decided to omit the elaborate displays of heavy machinery which usually featured previous shows and to substitute therefor light portable exhibits that could be accommodated in the hotel in which the convention was held. Last year the sixteenth annual convention was held in New York City on Feb. 25, 26, 27 and 28.

In the language of its constitution the objects of the American Road Builders' Association are "to acquire and disseminate information concerning highway construction and maintenance in the states and cities of the Union and in the provinces and cities of Canada; to stimulate interest in the subject, and to promote educational, legislative and other measures tending to their accomplishment." The annual meetings form a clearing house for ideas and experiences of leaders in the road building field. Papers are prepared and read, and extended discussions upon the subjects follow in which all in attendance may participate. In this way all the members attending the session profit by the thoughts and experiences of men from all parts of the country engaged in road building. These papers and discussions are printed in full annually in the proceedings of the association and copies are distributed free to the members.

In 1918 a constitutional amendment was adopted dividing the membership of the organization into five classes, as follows: Active, life, sustaining, contributing and honorary. Active members are "persons who are actively engaged in laying out or supervising the construction and maintenance of highways and streets and those interested in highway development." The annual dues for active members are $3.00. Life members are active members making a payment of $100 upon election to membership. Sustaining members are companies or organizations contributing $200 yearly, and contributing members are companies or organizations contributing $50 yearly. Honorary members are "those who have performed distinguished service in the cause of highway extension and improvement" and are nominated by the board and elected by the association. Active members are elected by the executive committee upon the recommendation of an active member. Only active and life members may vote or hold office.

Under the constitutional amendment of 1918, the territory from which the association's membership is drawn is divided into four districts, with 10 directors elected from the northeastern district, 4 from the southern district, 5 from the central district and 2 from the western district. These 21 elected directors together with the last five living past presidents constitute the board of directors. The active management of the organization is vested in an executive committee consisting of five members elected by the board. One of the members of the committee must be the secretary of the association and two of the other members must be residents of the northeastern district.

The present officials of the association are as follows:

President, G. P. Coleman, State Highway Commissioner, of Virginia; Vice President, Northeastern District, J. A. Duchastel, City Engineer of Outremont, P. Q.; Vice President, Southern District, R. D. Kneale, Member, State Highway Department of Georgia; Vice President, Central District, Robert C. Terrell, Associate Professor of Highway Engineering, University of Oklahoma; Vice President, Western District, S. Benson, Chairman, Oregon State Highway Commission; Secretary E. L. Powers, Editor, "Good Roads;" Treasurer, James H. MacDonald, Former State Highway Commissioner of Connecticut,

Past Presidents: W. A. McLean, Deputy Minister of Highways of the Province of Ontario, Canada; George W. Tillson, Consulting Engineer, LaGrange, Ill.; A. W. Dean, Chief Engineer, Division of Highways, Massachusetts Department of Public Works; H. E. Breed, Consulting Highway Engineer, New York, N. Y.; A. H. Blanchard, Professor of Highway Engineering, University of Michigan.

Directors: H. K. Bishop, Chief Engineer of Construction, Indiana State Highway Commission; M. F. Bramley, President, Trinidad Paving Co., Cleveland, O.; F. E. Everett, State Highway Commissioner of New Hampshire; Samuel Hill, Hon. Life President, Washington State Good Roads Association, Seattle, Wash.; J. Frank Smith, General Manager, Kansas Good Roads Association; C. M. Upham, Chief Engineer, Deleware State Highway Department; T. J. Wasser, County Engineer of Hudson County, New Jersey; Charles J. Bennett, State Highway Commissioner of Connecticut; Lt.-Col. W. W. Crosby, Consulting Engineer, Baltimore, Md.; R. A. Meeker, Consulting Engineer, Newark, N. J.; F. F. Rogers, State Highway Commissioner of Michigan; O. C. Rollman, Division Maintenance Engineer, Wisconsin State Highway Commission, Shawano, Wis.; Col. W. D. Sohier, Former Chairman, Massachusetts Highway Commission, Boston, Mass.; Lt.-Col. W. D. Uhler, Chief Engineer, Pennsylvania State Highway Department; Lt.-Col. H. L. Bowlby, Senior Highway Engineer, Bureau of Public Roads, U. S. Department of Agriculture; Wm. H. Connell, Engineer, Philadelphia, Pa.; Joseph W. Hunter, Township Commissioner, Pennsylvania State Highway Department; Nelson P. Lewis, Chief Engineer, Board of Estimate and Appointment of New York City; H. G. Shirley, Secretary, Highway Industries Association; Wm. R. Smith, President, Lane Construction Co., Meriden, Conn.

Executive Committee, G. P. Coleman, James H. MacDonald, R. A. Meeker, E. L. Powers, C. M. Upham.

The sessions of the convention and exhibition to be held in Louisville Feb. 9-13 will be accommodated in the First Regiment Armory which has about 53,000 sq. ft. available for the purposes. The armory is situated within a few blocks of the leading hotels of the city and officials expect a large attendance and a more comprehensive show than at any previous meeting. Louisville is advantageously situated and by extending her hospitality to the association raises the hopes of the officials that the Louisville convention will be the best attended of any yet held.

PROGRAM

Monday, Feb. 9, 2:30 p. m.

Address of welcome on behalf of the State of Kentucky, by Edwin P. Morrow, Governor.

Address of welcome on behalf of the City of Louisville, by Geo. Weissinger Smith, Mayor.

Response on behalf of the American Road Builders' Association, by George P. Coleman, President.

Appointment of Committees.

Monday, Feb. 9, 7:00 p. m.

Annual American Road Builders' Association Dinner, Hotel Seelbach, Informal. Tickets, $4 per cover.

Tuesday, Feb. 10, 9.30 a. m.

Chairman—H. K. Bishop, Chief Highway Engineer, Indiana.

"Design and Construction of Different Types of Pavement." (a) New Developments in Proper Construction of, and Bad Practices which should be eliminated in:

1. "Concrete," by A. N. Johnson, Engineer, Portland Cement Association, Chicago, Ill.

2. "Brick," by M. R. Greenough, Secretary, National Paving Brick Manufacturers' Association, Cleveland, O.

Report of Committee on "Is State Supervision of the Construction and Maintenance of All Highways Desirable?"

Chairman, A. R. Hirst, Chief Engineer, Wis., C. A. Brown, Chief Highway Engineer, Fla., Geo. E. Johnson, State Highway Engineer and Secretary, Nebraska, John H. Mullen, Chief Highway Engineer, Minnesota, Joe S. Boggs, Commissioner, Dept. of Public Roads, Ky.

Tuesday, Feb. 10, 2:00 p. m.

Chairman, C. P. Fortney, Chairman, West Virginia Road Commission.

"Design and Construction of Different Types of Pavement."

(a) New Developments in Proper Construction of, and Bad Practices which should be Eliminated in:—

3. "Bituminous Macadam," by J. E. Pennybacker, Secretary. The Asphalt Association, New York.

4. "Bituminous Concrete," by Theo. S. Oxholm, Engineer in Charge, Bureau of Engineering, New York City.

5. "Surface Treated Macadam and Gravel," by P. P. Sharpless, Manager, Tarvia Dept., The Barrett Co., New York City.

Tuesday, Feb. 10, 8.00 p. m.

Moving Pictures.

Wednesday, Feb. 11, 9:30 a. m.

Chairman—E. J. Mehren, Engineering News-Record, New York.

"The Relation of Highway Transport Surveys to the Economic Designs of Highways," by Arthur H. Blanchard, Professor in charge of Highway Engineering and Highway Transport, University of Michigan, Ann Arbor, Mich.

Discussion:

"New Highway Tests Being Made by the Bureau of Public Roads," by A. T. Goldbeck, Bureau of Public Roads, Washington.

"Fundamentals of Early Highway Construction and Are We Neglecting Them?" by H. G. Shirley, Secretary, Highway Industries Association, Washington, D. C.

"What Are the Fundamentals of Modern Highway Construction?" by W. G. Thompson, State Highway Engineer, Trenton, N. J.

Wednesday, Feb. 11, 2:00 p. m.

Chairman—George P. Coleman, State Highway Commissioner, Virginia.

Report of Committee on "Should the Township and District Board be Abolished as a Road Construction and Maintenance Unit?" Chairman—Paul D. Sargent, Chief Highway Engineer, Maine, E. R. White, Chief Highway Engineer, Iowa, Geo. C. Diehl, Erie County Engineer, New York, Frank Page, State Highway Engineer, N. C., C. P. Fortney, Chairman, State Road Commission, W. Va.

Business Session.

Report of Resolutions Committee.

Wednesday, Feb. 11, 8.00 p. m.

Reception and Dance, Hotel Seelbach.

Thursday, Feb. 12, 9:30 a. m.

Chairman—Jas. H. MacDonald, New Haven, Conn.

Report of the Committee on "Method of Strengthening and Reconstructing Highway Bridges for Heavy Motor Truck Traffic," Chairman, Willis Whited, Bridge Engineer, Pennsylvania; E. E. Brandow, Bridge Engineer, New York; C. M. Canady, Highway Bridge Engineer, American Bridge Co.; W. S. Gearhart, State Highway Engineer, Kansas; O. L. Grover, Chief Bridge Engineer, Bureau of Public Roads, Washington; J. E. Kirkham, Consulting Engineer, Iowa; A. M. Lovis, 1st. Ass't. Engineer, Massachusetts; W. R. Marden, V. P., & Chief Engineer, The United Construction Co.; R. V. P. Marquardsen, Bridge Engineer, North Dakota; C. M. Mead, Chief Engineer, Division of Bridges and Grade Crossings, Public Utility Commission, New Jersey; Chas. D. Snead, Bridge Engineer, Kentucky; M. W. Torkelson, Bridge Engineer, Wisconsin; G. G. Wickline, Bridge Engineer, Texas.

"For What Class of Roads and What Type of Construction should Federal Aid Funds be Used?" by Thos. H. MacDonald, Bureau of Public Roads, Washington, D. C.

Discussion by H. K. Bishop, Chief Highway Engineer, Indiana.

"Factors Which Will Limit Highway Construction During the Coming Season."

(a) "Car Shortage and What can be Done to Overcome the Shortage," U. S. R. R. Administration.

(b) "Materials—The Development of Local Supplies and Increasing the Output of Existing Plants."

1. "Developing Local Supplies" by H. S. Mattimore, Engineer of Tests, Pennsylvania.

Thursday, Feb. 12, 2:00 p. m.

Chairman—H. G. Shirley, Secretary, Highway Industries Association, Washington, D. C.

"Factors Which Will Limit Highway Construction During the Coming Season."

(b) Materials.

2. "Increasing Output of Existing Plants," by Lieut. Col. O. P. Chamberlain, V. P., and General Manager, Dolese & Shepard Co., Chicago, Ill., and F. D. Coppock, Pres., Greenville Gravel Co., Greenville, Ohio.

(c) Labor "How Can Supply and Effiency be Increased."

1. "Labor Saving Devices," by Richard Hopkins, Troy, N. Y.

Discussion.

Report of the Committee on "Regulations Covering Speed, Weight and Dimensions of Motor Trucks," Chairman, Geo. H. Pride, Pres., Heavy Haulage Co., New York; C. J. Bennett, State Highway Commissioner, Connecticut; Arthur H. Blanchard, Professor in charge of Highway Engineering and Highway Transport, University of Michigan, Ann Arbor, Mich; Chas. G. Bond, Counsel, Motor Truck Association of America; H. E. Breed, Former Deputy Highway Commissioner, New York; David C. Fenner, International Motor Co.; Geo. M. Graham, Gen'l. Sales Mgr., Pierce Arrow Motor Co.; A. H. Hinkle, Deputy Highway Commissioner, Ohio; S. V. Norton, Mgr., Truck Tire Sales, B. F. Goodrich Rubber Co.; W. G. Thompson, State Highway Engineer, New Jersey; Lt.-Col. W. D. Uhler, Chief Highway Engineer, Pennsylvania.

Thursday, Feb. 12, 8:00 p. m.

Motion Pictures.

Friday, Feb. 13, 9:30 a. m.

Chairman—A. H. Blanchard, Professor in charge of Highway Engineering and Highway Transport University of Michigan, Ann Arbor, Mich.

"Cooperation between Engineers and Contractors in the Execution of Highway Programs," by Chas. M. Upham, Chief Highway Engineer, Delaware.

Discussion by W. A. Rogers, Bates & Rogers Construction Co., Chicago, Ill., and Dalton Moomaw, Cuyahoga County Engineer, Cleveland, Ohio.

Report of the Committee on "Status of State Aid to Counties and Its Future Development," Chairman—F. Warren Allen, Bureau of Public Roads, Washington, D. C.; W. R. Neel, State Highway Engineer, Georgia; R. L. Saunders, Deputy Highway Commissioner, Connecticut; I. R. Browning, State Road Engineer, Utah; A. W. Graham, State Highway Engineer, Missouri; M. W. Watson, State Highway Engineer, Kansas.

Friday, Feb. 13, 2:00 p. m.

Chairman—H. G. Shirley, Secretary, Highway Industries Association, Washington, D. C.

Report of the Commitee on "What Part of the Total Cost of Highway Construction and Maintenance Should the Motor Vehicle be Expected to Bear?" Chairman—H. E. Breed, Consulting Highway Engineer, New York, S. E. Bradt, Supt. of Highways, Illinois, J Roy Pennell, State Highway Engineer, South Carolina, Z. E. Sevison, State Highway Engineer, Wyoming, Geo. C. Diehl, Erie County Engineer, New York.

"Modern Plant and Equipment for Highway Construction."

Discussion by Jas. Bannon, Contractor, Joliet, Ill., and C. S. Gale, Engineer, Delaware Highway Department.

Wisconsin's 1920 Road Maintenance Program

Amounts Available and to be Expended for Maintaining the State Trunk Highway System and the Secondary Roads Included in the County Trunk Systems—Proposed Methods

The Wisconsin Highway Commission has completed the compilation of the returns from the various counties showing the maintenance funds appropriated by the county boards. According to official figures, there will be expended in 1920 for the maintenance of the state trunk highway system, now consisting of 7,500 mi., and for the maintenance of the county trunk systems in the several counties that have adopted such, probably amounting to another 6,000 mi., the total sum of $3,550,000.

There will be available for the maintenance of the state trunk highway system approximately $1,850,000. Of this amount there will be available from the automobile license fees $1,600,000, and certain counties that have exceptionally heavy traffic have appropriated an additional $250,000, making the total above mentioned.

This will be expended upon approximately 7,100 mi. of state trunk highways. The balance of the 7,500 mi., or approximately 400 mi., will not be ordered maintained during the season of 1920 by the commission. The 400 mi. mentioned comprise portions of the state trunk system that have been selected for the future, but are not now maintainable. Some of them are open for travel, but not for the entire distance. The new state trunk system will require the employment of about 900 patrolmen for the 1920 season.

About 40 counties have adopted county trunk highway systems, which comprise what are termed secondary roads. The counties have appropriated sufficient sums to insure the maintenance of the county systems in an adequate manner by the patrol method. There will be available from the appropriations by the counties approximately $1,060,000, and there will be available from the first 25% of the automobile license fees the sum of $640,000, making a total of $1,700,000 that will be available for the secondary or county trunk systems. It will require about 700 patrolmen to maintain the county trunk systems in the various counties.

After only two seasons of trunk highway maintenance, the general public is so well satisfied with the results, according to a statement by the commission, and has become so interested in the adequate maintenance of all roads that the county boards have seen fit to appropriate these large sums for the maintenance of additional lines of travel in a majority of the counties in the state.

Up to Dec. 31, 15 counties of the state had taken referendum votes on bond issues for road purposes favorable to the proposed issues. The total bond issues thus authorized amount to $35,000,000. Four counties—Dane, Outagamie, Iowa and Grant—voted adversely to bond issues. The 15 counties that supported the bond issues were the following:

Rock, $1,500,000; Jefferson, $2,000,000; Washington, $2,000,000; Florence, $100,000; Wood, $1,500,000; Green, $3,000,000; Douglas, $1,200,000; Brown, $2,500,000; Dodge, $5,400,000; Fond du Lac, $4,600,000; Green Lake, $900,000; Ozaukee, $1,500,000; Racine, $2,650,000; Walworth, $3,250,000; Waukesha, $3,800,000; total $35,000,000.

The maintenance of the two systems will give Wisconsin 13,000 mi. or more of main traveled highways maintained in an adequate manner during the season of 1920. To insure the proper expenditure of these large maintenance funds, the State Highway Commission will recommend to all the counties that have adopted secondary or trunk systems the employment of a competent maintenance superintendent to assist the county highway commissioner in supervising the work of the patrolmen on both the state and county trunk systems. This method was followed in eight or ten counties during the season of 1919 with very satisfactory results. The patrol superintendent's time and expenses were prorated over the two systems, and the plan worked out very satisfactorily where tried. It is hoped to have it extended to all counties maintaining secondary systems and to all other counties where the highway commissioners' duties are such that they are unable to see each patrolman at least twice a week.

The counties must exercise a certain amount of supervision over the patrolmen, or there will be a few who will not give service for the salaries paid them.

Uniform Vehicle Law Drafted

Joint Committee of Highway Associations Proposes Uniform Measure for All States

A uniform vehicle law has been drafted by the joint committee on uniform vehicle laws of the American Association of State Highway Officials, the National Automobile Chamber of Commerce, the American Automobile Association, and the Highway Industries Association. The law was prepared after a number of meetings and a thorough consideration of the subject from the standpoint of the road builder, the user of the road, the manufacturer of vehicles, the carrying capacity of the road, the pedestrian and the general public's welfare and safety.

The committee agreed on practically all the provisions in the proposed measure except the gross weight of the vehicle, including load, and the point at which the width of tire should be measured. It is pointed out by the committee that there is urgent need for a law of this nature and much favorable comment has been expressed in editorials and news articles in the daily press, trade journals and magazines, in all sections of the United States.

Pennsylvania Prepares to Build Own Roads Under New Law

Highway Commissioner Sadler Announces the Appointment of D. M. Hepburn as Superintendent of New Construction Branch of Department

Because of the activities of Governor Sproul and Highway Commissioner Lewis S. Sadler, of Pennsylvania, legislation has been enacted in that state permitting the highway department not only to maintain roads but also to build them. Accordingly the highway department will have, during the 1920 season, construction crews of its own at work, building important stretches of state highways on the primary system. In addition it will own its own construction equipment and will open its own sand banks and quarries, under the direction of a new branch of the department under Chief Engineer W. D. Uhler. The superintendent of the division will be Donald M. Hepburn of Philadelphia who was recently selected chief of the Philadelphia Bureau of Street Cleaning under Director of Public Works Winston. He has been loaned by the Highway Department to assist in the reorganization of that bureau for the next few weeks. Mr. Hepburn, whose salary has been fixed at $5,000 per year, has had a large experience as a construction engineer, handling successfully the housing proposition at Hog Island and other projects of magnitude throughout the country.

It is reported that department engineers have found suitable stone and sand deposits in many localities; and with hundreds of leases already in effect will be able to secure these materials at reasonable prices without delay. However, because of the extent of the department's program, it has been stated that the number of contractors who will build roads will be greater than ever.

HIGHWAY TRANSPORTATION

What Are We Going to do with the Roads When We Get Them?

BY GEORGE H. PRIDE[*]

The early history of the world shows that roads were developed by two distinctly different agencies—first, military force; second, the natural horse sense of the animal kingdom in picking the easiest paths.

Traveling through centuries with photoplay speed, the world-famed Bowery of New York was practically laid out by cows returning from pasture. Historians conversant with the early settlement of New York may perhaps contradict this statement, but certainly no human being ever laid out Pearl Street in lower Manhattan which is renowned for its circuitous and ever-changing direction. It has been thought that even a self-respecting cow would deny that any well regulated member of its family was responsible for a street laid out in such a perverse fashion.

Again making another rapid jump tho the present day, I am persuaded that there have been highways laid out with an almost similar degree of intelligence (?) but happily this method is rapidly disappearing, and highways are now being laid out more nearly to fulfill an economic function in the country's life.

Looking upon the country as a whole, from a transportation standpoint, the only economic justification for building roads is that they furnish a possibility of vehicular transportation from one community to another, and second, that there exists the necessity of transporting commodities between these communities.

At the present time the general custom of constructing highways is to tax the people as a whole, directly or indirectly, for the cost of the initial construction of the roads and also tax them in addition for sufficient funds to properly maintain these roads—when through the efforts of a Supreme Providence, the legislative authorities having jurisdiction, are endowed with enough brains to realize that after getting the roads, the next important step is to keep them roads. I am pleased to note that the idea of maintenance is becoming more generally realized by our legislative solons.

After having battled for years to secure funds to build the roads, and following a severe session with the contractor who builds the roads, and still further having secured the necessary funds and brains to maintain the roads, the next step in the procession apparently is—how shall the roads be used to make them fit most effectively into the economic structure of the country?

At present there are two diametrically opposed views concerning this. One view is that which was most potently expressed by some of our national civil service employees, whose function presumably was to encourage construction of roads and their use, but who developed, however, the rather novel idea that once the roads were built, their whole idea thereafter was to keep the roads in excellent condition, and that the best way of doing it was by practically prohibiting their being put to useful service. In other words, by placing such severe restrictions on the type of vehicle using the roads that they practically would never operate on the roads. The other view was much more modern in growth, and it had the equally destructive idea, that once the roads were made, loads of unlimited weight should be permitted upon the roads regardless of whether this would destroy them or not. These men consisted almost entirely of motor truck operators and some few motor truck manufacturers.

I would like to make a plea, however, for a medium course between these two extremes. It is perfectly obvious that the road is only one portion of the great tool which furnishes transportation between communities, and that the motor truck is only a similar portion, and of only relatively similar importance. The general public as a whole pays for the construction of the roads, and just exactly to the same degree does the general public as a whole pay for the cost of the commercial motor transportation over those roads. In the first instance, it pays either directly or indirectly in the way of taxes; and in the second instance, it pays directly or indirectly in the purchase price of every commodity that it uses, as practically every commodity now is transported over the highways by motor trucks at some stage in its fabrication. If the restrictions placed on the type and weight of the vehicle using the roads makes the cost of the transportation over those roads unduly high, the public is paying that unduly high price in purchasing those commodities. If, on the other hand, owing to lack of reasonable restrictions, motor trucks carrying excessive loads unduly damage the road surface, the decrease in cost of transportation owing to the very heavy loads is more than counter-balanced by the grave damage done to the road, the public again being penalized through excessive road repair costs.

The correct answer to this problem is exactly like that to any other engineering problem. Restrictions on both the trucks and the roads should be so balanced that the net compensation for the wear on the road and the cost of truck tonnage transportation is reduced to its minimum.

There have been certain steps made in this direction by a great many states, and in most instances the decisions reached have been commendable. Some were unduly radical but as time went on these were changed to reasonable conditions, but the keynote of the entire situation rests upon the degree in which these rules and regulations are enforced. In no state of which I have any knowledge has any efficient means of enforcement been put into effect. This is unfair to the state highway officers who constructed the roads; unfair to the general public which pays for the roads, and unfair to the law-abiding citizen operating motor trucks who adheres to the law, to his own detriment, but is directly beneficial to the unprincipled, short-sighted truck operator who pays no regard to the law because it is not enforced, who overloads his truck ruthlessly and damages the roads to everybody's detriment but his own.

There have been unlimited conferences on the subject of weight and speed limitations. What a welcome change it would be if there were some manifestation of the enforcement of the laws which have been passed regarding these points!

New York University to Teach Motor Transportation

New Course Dealing with Applications of Motor Truck in Industry to be given by Transportation Expert of Packard Company

A course in motor transportation engineering is to be added to the curriculum of New York University to begin this month, according to an announcement made recently by Dean Charles H. Snow, of the School of Applied Science. The new course of study, which is considered a clear indication of the ascending importance of motor truck transportation, is to be given by F. Van Z. Lane, Chief Transportation Engineer of the Packard Motor Car Co. It will form part of the new course in industrial engineering and will be open to students in mechanical and civil engineering, particularly those specializing in subjects relating to highway engineering.

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[*] President, Heavy Haulage Co.

"The course will have more to do with the application of the motor truck than the mechanics of it," says Mr. Lane. "The Motor truck is part of the mechanical equipment of every industry and engineers entering any industry must become more familiar with its application. The course in motor transportation will deal solely with the application of the truck as a transportation unit in industry and is not be be confused with motor truck design.

"It has been proved, under the most trying circumstances, that the motor truck is mechanically dependable and that by applying it correctly it is an economical means of transport. and that to get the most efficient service from their equipment those in industry should understand how it can be used with the greatest effectiveness. New York, which is the largest user of motor trucks in the country, is a huge laboratory for this work."

Mr. Lane is a graduate of New York University and was an engineer in the Brooklyn Street Department. He has served various city plan commissions, municipalities, civic organizations and industries as transportation engineer and has also studied the subject abroad.

Special Milk Carrying Truck

Milk and Ice Cream Company in Pittsburgh District Uses Fleet of Trucks to Carry Milk—One Machine Carries Special Tank

The accompanying illustration shows a motor truck equipped with a special tank for carrying milk from a collecting station to a condensing plant 10 mi. distant.

The specially built tank is made of steel and is lined with glass. It has a capacity of 900 gal. and is practically a giant "thermos" bottle, in the words of the district superintendent of the company. It keeps the milk cool, even in the hottest weather, according to that same official, who adds: "It is cleaner than cans and gives us far greater speed in loading and unloading." The tank is mounted on a 5-ton White chassis.

The firm that operates the vehicle shown, the Reick-McJunkin Co., is one of the largest milk and ice cream companies in the country. It supplies the district centering around Pittsburgh, Pa., getting its milk and cream from a territory chiefly within a 150-mi. radius from that city. It operates 31 White trucks, its fleet having grown from two of those machines purchased in 1916.

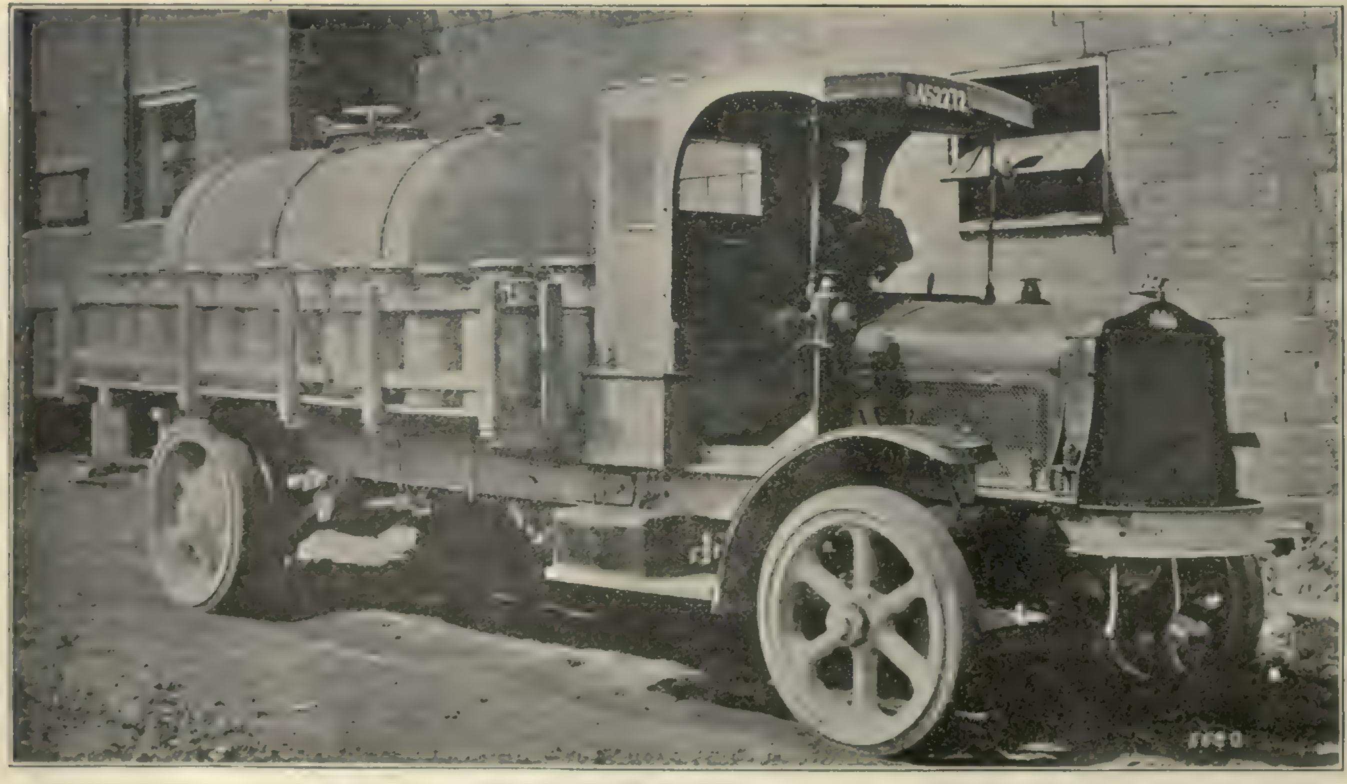
Truck Freight Service Planned for Louisville District

Company Formed by Business Men of City Will Operate 50 Trucks on the Main Highways To Principal Points in 100-Mile Radius

Planning to operate a motor truck service over the main highways leading out of Louisville, Ky., in all directions, the Union Transportation Lines was incorporated in that city recently. It is proposed to put from 50 to 100 trucks into operation at the earliest possible time for carrying freight to and from Louisville and points within a radius of 100 mi. in Kentucky and Illinois.

A modern two-story freight depot will be erected in Louisville, according to the plans, and will be used as a center for the company's business. It will contain a rest room for women, and lockers will be provided in which may be placed packages and bundles from their city shopping. A business room for men will also be provided, with daily market reports on file and telephones and similar facilities. Garage space will be available for the out-of-town visitor, and every assistance will be given him in the sale of his products and the purchase of his supplies.

The project was started by a number of Louisville business men interested in providing reliable and convenient freight transportation between Louisville and surrounding points. H. C. Kelting, Manager of the Merchants' Wholesale Grocery Branch, Louisville, Ky., is president: W. J. J. Preuss, formerly with the Kentucky Railroad Commission as chief transporta-



WHITE TRUCK WITH SPECIAL MILK TANK OPERATED BY REICK-McJUNKIN CO.

tion rate expert, is traffic manager: H. A. Kampfmueller is superintendent of the Louisville terminal and depot, and D. R. Ogden is secretary.

Highways and the Average Citizen

By R. E. FULTON*

William Brown, average citizen, picked up his evening paper and sat down to read.

He read a headline—"Railroad Finances Crippled; Higher Freight Rates Coming."

"Ho-hum!" said Brown to himself. "I'm glad I'm not in the transportation business. Railroad finance means nothing in my young life."

He turned over the page. "Freight Cars Scarce as Traffic Demands Increase," he read.

"Oh dear! That must be tough on the big producers," was about the extent of his interest in this fact. He yawned and turned over the page again.

Suddenly he saw something that did interest him. He read the article through twice, laid the paper down and called to his wife.

"Sadie," he said, "here's an article in the paper that says that eggs are going up to a dollar and a quarter a dozen." Wherewith was started a heated discussion on "what the world was coming to" and "what was the poor salaried man going to do."

It does'nt matter much to W. Brown, average citizen, what happens to the railroads. You see, he is primarily interested in things that affect him intimately.

The other day Brown went out for an automobile ride. He struck a bad piece of road and blamed the motor truck for damaging highways. He had considerable difficulty at one place in passing a truck that was heavily loaded with freight, and said that he didn't see why they were allowed to monopolize the roads. It never entered his mind, of course, that the motor truck had as much right to the highway as he had—that it was producing for him, and that it was helping to keep living costs down. He didn't ask himself why roads weren't built strong enough to hold the motor truck traffic, or why they weren't built wide enough to give plenty of room to both pleasure and commercial cars. He is, you see, primarily interested in things that affect him intimately.

Railway finances, freight congestion, eggs, motor trucks, highways, and William Brown, average citizen, are all related intimately one to the other. Railway freight rates are advancing steadily, because the railroads' finances are so low. Freight congestion prohibits the normal flow of commodities from producer to consumer. These two conditions are big factors in the high cost of eggs to William Brown, the first by increasing their cost of transportation and the second by decreasing their supply in relation to the demand for them.

Railway finances are low principally because their business under present conditions is unprofitable for them. A very large percentage of this loss is attributable to the inconvenience and delay of handling small shipments, short hauls and transfers. Short-haul transportation and transfer of freight within a city are largely responsible for car shortages and freight congestions—they necessitate leaving empty cars on sidings and spur tracks until they can be moved by engines, causing delay and loss of car space that otherwise could be used for long-distance hauling where there is no waste.

Motor trucks, if given adequate highway facilities, can do much to relieve these conditions. They can perform these functions more economically than the railroads can. They have proven themselves capable of eliminating all of this waste in handling freight, and if given proper highways and proper recognition, could take over entirely these forms of transportation that are unprofitable to the railroads and that congest their terminals, incidentally lowering the cost of eggs for William Brown, average citizen.

Sooner or later Brown is going to cast his ballot on the good roads question. Wonder what he is going to do about it?

The Importance of Good Roads

BY WINDSOR T. WHITE*

Roman roads after 2,000 years of service are better than most of the roads in this country. Does this not teach the lesson that well constructed roads, while the initial cost may seem large, are, in terms of service, really economical? France, in her struggle to remain an independent nation, found that the roads laid by the Roman legionnaries made possible the rapid shifting of her comparatively small army to best withstand the enemy attacks.

In the United States is found a belated appreciation of good roads. So great a state as New York, even though it has a much higher percentage of improved roads than is common for the entire country, has of 97,798 mi. of road only 18,400 mi. surfaced. It is with the advent of the automobile and motor truck that we have come to realize the necessity of good roads.

Four or five years ago a movement began which today has grown to such importance that it is being linked with the great carriers, the railroad and the steamship. The new movement is transportation by highway. The motor truck is the carrier. It is now regarded as the logical short-haul transportation agency. Last year two one million dollar motor transportation companies were organized. This year a two million dollar company has been started. The former companies operate out of Kansas City, Mo., and Louisville, Ky., the latter out of New York City. In addition there are thousands of smaller companies which operate out of the different towns and cities of the United States. If New York State may be taken as a criterion, every town with a population of 1,000 or over has one or more motor transportation lines operating in or about it.

While not the greatest, at least striking is the development of this form of transportation in agriculture. This is especially true in the hauling of hogs and wheat. At Omaha, Neb., the number of hogs brought to the stockyards by motor truck was 184% greater in 1918 than in 1917. At Indianapolis 462,313 hogs were received by motor truck in 1918 as against 271,994 in 1917, an increase of 190,319 head. The hogs were hauled from all distances up to 80 mi. and were carried in motor trucks which ranged from the small ¾-ton machine to the large double-decked vehicle having a capacity of 13 hogs. At Louisville, Ky., from 80 to 100 motor trucks, carrying grain, have been received by the Ballard & Ballard Co. daily. Motor trucks have arrived at this city from 7 a. m. to 7 p. m. and have brought in such a volume of wheat that the elevators became clogged.

Long Island is one of the most prosperous agricultural areas in New York State. It is not exceptionally fertile; in fact, it may be said that it is fertile because man has made it so. There are many areas in the state that are naturally more productive than is Long Island, but which are far less prosperous. A trip over the Island would immediately disclose the reason for this prosperity. A well planned, well constructed and finely maintained system of roads is the greatest asset the Island has. Every evening one can see hundreds of motor trucks, of from 2 to 5 tons capacity, rolling over these roads, bound for the markets. Good roads, motor trucks, and work have made Long Island an important agricultural district.

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*Vice President, International Motor Co.

*President, The White Co.; Chairman, Motor Truck Committee, National Automobile Chamber of Commerce.

A recent survey, made by "Hoard's Dairyman" of 70,000 dairy farms in the United States showed that the average production of a farm was 10,000 gal. of milk, and was hauled an average distance of 3.5 mi. Of these 70,000 dairymen, 50% or 35,000 made this trip every day. With two horses and a wagon it takes 2½ hours for a trip. A large motor truck can cover this distance in one-half hour and combine the deliveries of 30 or more producers. By using the motor truck, a daily saving of 70,000 hours—which at 25 ct. an hour for man labor and 10 ct. an hour for horse labor gives the enormous sum of $22,995,000—is possible.

An investigation conducted by the United States Department of Agriculture showed that it cost $34,000,000 to move a $465,000,000 wheat crop or a hauling cost of 7.3% of its value. To put it in a different manner, the primary hauling charge was 9 ct. per 100 lb. The charge for oats, rye, potatoes, hay, beans, barley and flaxseed was about the same, while apples, buckwheat and rice cost from 11 to 12 ct. a hundredweight.

The report of the Joint Congressional Committee of 1914 showed that the average cost of transportation per ton-mile on the highways of the United States was 21 ct. A reasonable improvement of all roads, at a cost of somewhat less than that of macadam construction, it was estimated, would reduce the cost 8 ct. per ton-mile, while rock surfaced roads, engineers stated, would cut the figure by two-thirds.

The value of all farm products in 1918 was over $21,000,000,000. If the primary hauling charge is assumed as applicable to all farm products, the cost of the primary haul of farm products is $1,533,000,000. By rock surfacing all roads an annual saving, in primary hauling alone, based on the Joint Congressional Committee report, of $1,022,000,000 could be effected.

How modest in comparison with this billion dollar saving is the $100,000,000 requested in Senator C. E. Townsend's National Highway Act.

The benefits that follow in the wake of good roads as demonstrated by improved lands and buildings, change from shiftlessness to constructive activity, better schools and churches, closer social intercourse, greater civic interest and better living conditions are of incalculable value. The results which have followed road improvement in those localities where a good roads program has been developed are sufficient to justify an almost unlimited expenditure for road work. Let us all work for good roads.

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Maps of State Highway Systems for Public Use

(Continued from page 56)

Progress Maps

For the purpose of showing graphically the progress in constructing state road systems, it is usually advisable to have a progress map so drawn as to indicate the roads under construction, roads partially completed and roads completed on the state system. This map should first be drawn showing the state roads with a double line, so that as the work progresses, these lines can be filled in, either by different colors or with a progressive system of symbols.

Special Maps

A number of special maps are of use in the work of a highway department. For the purpose of explaining state bond issues elections to the people, skeleton maps showing straight-line connections between principal points are adequate when combined with maps showing graphically the area, population and valuation affected.

French Road Maps

The French maps which were highly praised by service men are a very complete system of highway maps with every detail shown. The country is divided into sections so as to permit of a larger scale than would be possible if the entire country were drawn in one map, and by referring to a key map on the back of each section they can be very easily combined. A feature of special value to the traveler, which is shown on the French maps but which we have not found on any of our American highways maps, is the showing by symbols of all ascents and descents, special reference being given to dangerous descents.

France, we are told, has a very excellent system of highways, which has been built up through many years, and this fact is used by some as an argument in favor of the proposed national system of highways. But when we consider that France has an area less than that of the state of Texas, we begin to realize the stupendous task that faces us to formulate a national policy for the United States that will satisfy our multitude of conditions and prove satisfactory to the country in general.

Guarantees for Pavements

(Continued from page 58)

year bonds. Spend the bond money for enginering and inspection fees and better results will invariably be obtained.

In 1907, Francis P. Smith assisted the writer, being his asphalt expert, on Fifth Street in Little Rock, Ark. Although a heavy traffic street with a car-line in over half the length of the pavement, this is an almost perfect piece of work today. Only a small bond, although for five years, was required of the contractor and it was never necessary to even refer to it. The good results were obtained because the commissioners provided for adequate and competent inspection. This, too, was in the face of the fact that some of the contractors' superintendents could not be trusted altogether and had to be closely watched.

Reputable contractors are often imposed upon by foremen and others attempting to make a "record" in saving material, or in fast work. A competent inspector, in such cases, insures the contractor protection he actually desires. Competent inspection, too, gives the engineer in charge adequate representation. The specifications are prepared for the contractor and he has no alternative than to bid upon them as written. He cannot change them in the least, regardless of his own opinion. And his construction must be along the lines laid down and no other.

A locomotive engineer receives orders (specifications) from the train dispatcher directing him to proceed with his train. If he meets another train on the road and a wreck occurs, the dispatcher is the man at fault. The engineer can only go according to his orders. The contractor can only build according to his orders, the specifications. Consequently, he should only be responsible for faulty work and faulty material.

In purchasing an automobile or a watch, a guarantee is given to protect the purchaser, for a year's time, against defects of material or workmanship. It matters not the kind of car or watch, nor the price paid for it. Only a year's guarantee is given and that only for protection against defects in construction. Should more be asked of the contractor on our paving and highway work? Does the additional 22.5 ct. represent protection to the property owner, or to the contractor? The writer is of the opinion that 22.5 ct. is needlessly added to the original cost of the work and that neither property owner nor contractor benefits thereby. The property owner pays 22.5 ct. additional, but he gets no better work. The reputable engineer is going to inspect his work as carefully with the bond as without one.

No engineering expense is saved. The bond company is the only beneficiary, so far as construction costs are concerned.

An architect is employed to design a million dollar building. The contractor gives bond for faithful performance of his contract and the building is erected under the architect's supervision. At the completion, architect and owner go over the work and on the architect's certificate final acceptance is had and payment made the contractor. Perhaps, because of the difference in character of usage, as with the automobile, a year's guarantee against faulty construction unknown to engineer or contractor should be required. Certainly it is asking too much of the property owner to require a payment of 7.5 ct., 15 ct. or any other sum for future maintenance except as a maintenance expense. If we want long term "guarantees" let us drop the term guarantee and not longer camouflage. Let us ask for pavements and add a maintenance clause or contract for a term of years as an addition.

The Value of Highway Transport Surveys

(Continued from page 60)

in connection with farms and forests, mine and quarry, steam and electric railways, and will close our inquiry by getting right down to cases and see what a survey can do for the individual business.

The hauling and delivery problems of every business should be surveyed in order that the most efficient means of transportation can be used, particularly in reference to the highways. It is astonishing how little most concerns know about the cost of the delivery and hauling end of their business. The concern that usually knows its labor, production, accounting and selling costs, many times has no idea of what its delivery cost is. Yet the delivery and hauling part of the business usually amounts to a great deal. A survey of such problem will often indicate that it would be more economical to ship or deliver by motor truck than by horse-drawn vehicles, railroad freight or express or by boat or electric railway. In considering a transportation system the nature and character of the business it serves should be considered first.

The proper kind of a survey will bring out all the items entering into the cost, which would never be brought out in any other way. For instance, I had occasion the other day to make a survey of the shipping part of a business concerned with the rolling of steel products. This was a large concern with a railroad siding right into its plant. Its products take a very low freight rate and its deliveries are mostly to points located within 60 mi. of the plant. Yet this survey showed that the motor truck could be used to better advantage than the railroad; that it could transport material cheaper and exactly as it was wanted.

This survey developed, for example, that the average cost per box used to contain the material was $1.25 and that the average weight of these boxes was 42 lb., something that the traffic manager of this concern had never considered before in his transport problem. Motor trucks are now being used by this company, thus releasing several freight cars for use where the railroad is the more economical means of transport.

The proper sized trucks, the most adaptable kind of body, and the use of loading and unloading devices will many times serve to handle the hauling problems more economically and efficiently.

Such a survey should take us behind the lines—so to speak—back of the loading platform into the shipping room where we could consider such items as boxing, crating, sorting, assembling, routing, internal delivery, etc. It is here that, oftentimes, a study will show how the use of highway transport can cut down the cost of the work leading up to placing the material on the truck or on the car.

In making surveys relative to the establishment of highway freight transport lines, the following items should be carefully considered: All year round road conditions, including bridges; rail freight and express rates; frequency of existing service; time of delivery of existing service; amount of, kind of, freight moving in both directions between the points in question; running time possible; sentiment of the district under consideration toward existing and proposed service; sufficient financial support; traffic laws, ordinances and regulations.

Road conditions will determine the kind of equipment that can be operated. The amount and kind of freight will determine the size of the unit, and number necessary, from which can be determined the expense, to which should be added (this is most often omitted) overhead charges, by which I mean the cost of soliciting business, storing and handling of same, superintendents, etc., and which for such lines runs very high. The cost of operation will determine the rate. This compared with existing rates and services will determine whether or not business can be secured under such costs. The possibility of promoting return loads should not be forgotten. This, you will note, is quite different from the usual methods of arbitrarily determining a rate, which is probably that charged in some other locality and without knowledge of actual conditions.

In a survey of the possibility of establishing inter-city motor truck routes out of a certain city recently made, we concluded that the lowest capacity truck that could be operated, considering the rate that could be obtained, would be a 3-ton size. Yet the operators disregarded our advice and started in with 2-ton trucks. If loaded to 80% of their capacity on every trip, in both directions, they couldn't pay—and didn't—the results being the failure of another line and the loss of much confidence.

All this information is very easy to get if gone after in the proper way. Most communities now have commercial organizations which will be very glad to assist in the accumulating of such data.

Reliability in such service is absolutely necessary. In the case of highway passenger transport, the number of passengers will determine the seating capacity desired and the frequency of operation, which together with the length of haul will determine operating expenses and, therefore, the fare that must be charged. Here again reliable service must be inaugurated, as reliability is important in all transport matters.

There is no more important question before the public today than that of highway transport surveys, and if this organization can succeed in putting some interest into this subject, it will have accomplished a big work.

* * *

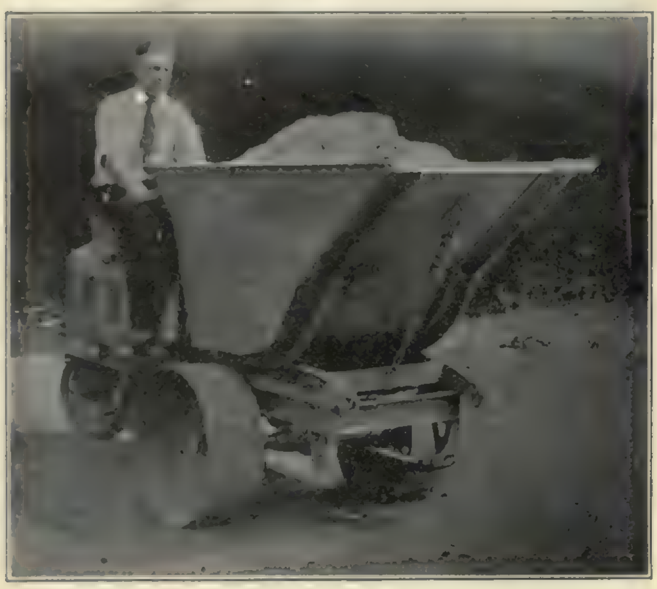
The Missouri State Highway Board has anounced that 49 federal aid road projects in that state, with a total length of 459.29 mi. and of an estimated cost of $5,948,910, have been approved by the U. S. Bureau of Public Roads. The Federal Government is to pay $2,606,975, and the state and the counties the remainder.

During the Year of 1919, Hamilton County, Iowa, spent $198,539.59 for road improvement, according to the report of County Engineer O. O. Howde. None of the federal aid money was used during this period and so there will be availbeable approximately $150,000 of federal money for the present year, which added to that available from the county, will make a total of about $350,000 to be expended on road work this year. The first large improvement will be on the Grant (Hawkeye) Highway running through Webster City, which will be graded and drained.

EQUIPMENT—TRADE—MATERIALS

New Concrete Materials Conveyor

A machine of new design to facilitate the handling of materials to and from concrete mixers has been introduced by the Clark Tructractor Co., of Chicago, Ill., and is shown in operation in the accompanying illustrations. It is called the "Tructractor" and, while similar to the motor truck in operation, is much smaller in size and different in construction.


CLARK "TRUCTRACTOR"

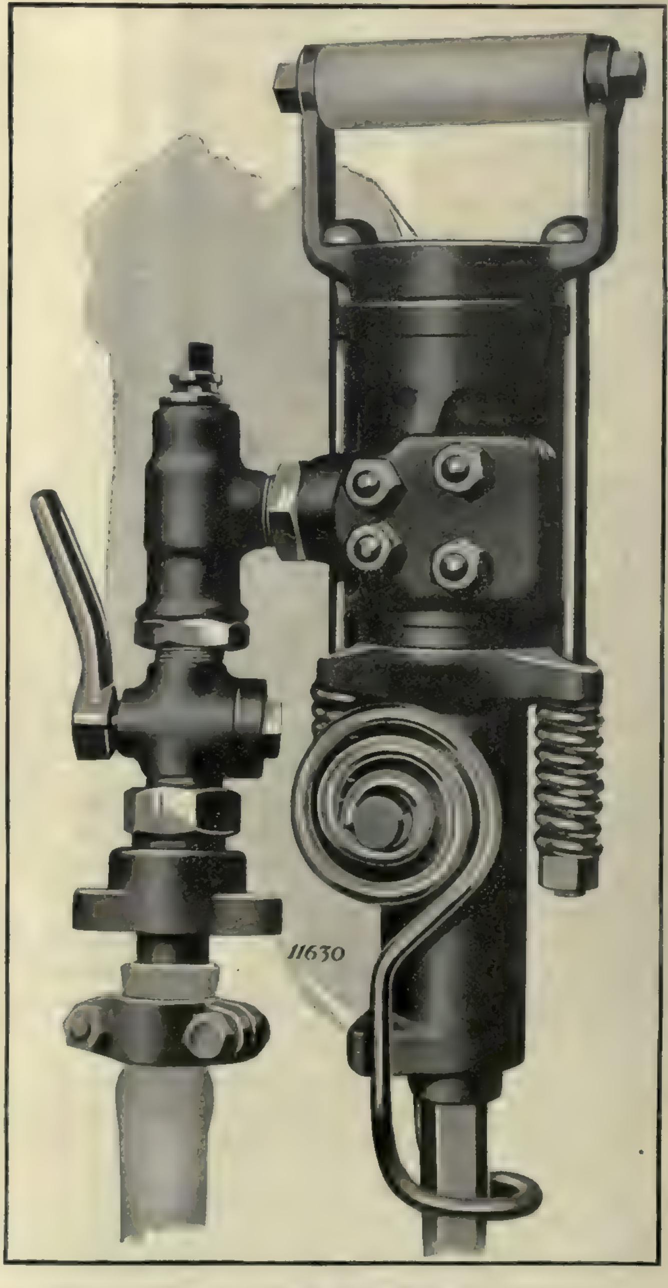
The machine has three wheels, the load being carried over the two front driving wheels, while the single rear wheel is used for steering. In the automatic dump body model the driver controls the dumping and steering without leaving his seat. The metal hopper has a capacity of 1 cu. yd. of dry mix and automatically spots and dumps its load in any desired place. It will take wet mix directly from the central mixing plant to the roadway or dry mix from storage piles to the mouth of the portable mixer without rehandling. It is equipped with wide faced steel wheels to prevent the cutting up of the finished subgrade and is propelled by a standard 4-cylinder gasoline engine, operating at speeds varying from ½ to 12 mi. per hour, with an average consumption of 3 gal. of gasoline per day. The machine is constructed of steel throughout and the engine is placed above the rear wheel. The short turning radius in which the machine can operate permits its use in limited working space.

"TRUCTRACTOR" IN OPERATION ON A CONCRETE ROAD JOB

A New "Jackhamer"

A new drill recently put on the market to meet the demand for a light, self-rotating hammer drill is shown in the accompanying illustration.

The drill weighs 21½ lb. and can be used in many places



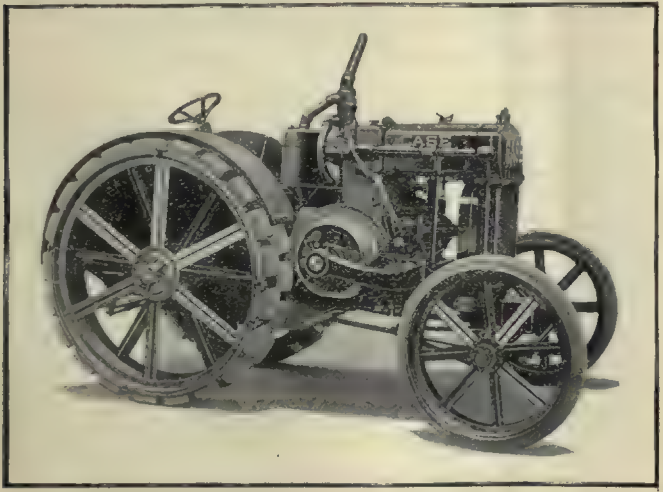
NEW INGERSOLL-RAND "JACKHAMER" DRILL, BAR-33 MODEL inaccessible to heavier machines. It is recommended by the manufacturer for bench work in soft limestone quarries, for trimming in metal and coal mines and for pop hole work in quarries and open pit mines. It is also especially adapted to drilling in concrete and masonry foundations and for similar work. It is not recommended for drilling deep holes or for use in hard rock, but for drilling where a machine of extremely light weight is necessary.

The drill is made by the Ingersoll-Rand Co., and is one of that company's line of "Jackhamer" machines. It is designated as the BAR-33 model.

Rubber-Tired Kerosene Tractor

Two views of a rubber-tired kerosene tractor for general hauling are shown in the accompanying illustrations.

The main frame of the machine is a one-piece casting, designed for securing perfect alignment of the gears, shafts and bearings, as well as for rigidity and strength. The motor is a Case 4-cylinder, 4-cycle, vertical, valve-in-head type. The tractor is built in two sizes designated as the 10-18 and the 15-27. On the former the cylinders have a 3⅞-in. bore and a 5-in. stroke; on the latter the bore is 4½ in. and the stroke 6 in. The engine is mounted crosswise on the main frame, permitting the use of all spur gears.



CASE RUBBER-TIRED KEROSENE TRACTOR

The over-all dimensions of the 10-18 machine are: length, 9 ft.; width, 4 ft. 4 in.; height, 4 ft. 10 in. The 15-27 tractor is 10 ft. 7 in. long, 6 ft. wide, and 6 ft. 6 in. high. The rear wheels on the 10-18 are 42 in. in diameter and 9 in. wide; on the 15-27 they are 52 in. in diameter and 12 in. wide. The front wheels on the two sizes are 30x6 in. and 32x6 in., respectively. All four wheels are equipped with Kelly-Springfield rubber tires, those on the rear wheels being in the form of staggered pads, as shown.

The road speeds of both models are 2¼ and 3½ mi. per hour. The fuel tank capacities are as follows: 10-18, gasoline, 2 gal. kerosene, 10.5 gal.; 15-27, gasoline, 2.75 gal., kerosene, 20 gal. The gasoline is used for starting, both tractors utilizing kerosene economically and developing the full rated horse power on it.

The tractors are manufactured by the J. I. Case Threshing Machine Co., of Racine, Wis.

Barrett Company Lectures

For several years past the engineering staff of the Barrett Company has given a series of lectures before engineering societies and students of engineering and highway schools, the lectures dealing with the various phases of the application of coal tar materials to the solution of modern highway problems.

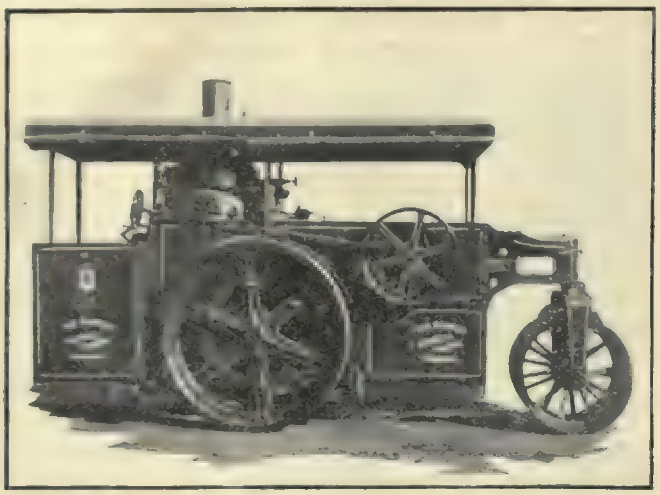
These lectures have proven very popular and the calendars of the staff for the coming year are well filled. The first lecture of the series deals with the chemistry, manufacture and control testing of refined tars; the second treats of the laboratory tests to which road tars are subjected; the third covers the construction of pavements with refined tars; the fourth takes up the various city pavements of the block type; the fifth is a discussion of wood preservation; the sixth deals with wood block pavements; the seventh covers maintenance problems, and the eighth describes the methods of maintaining broken stone and gravel roads.

CASE KEROSENE TRACTOR IN OPERATION

Macadam Roller of New Type

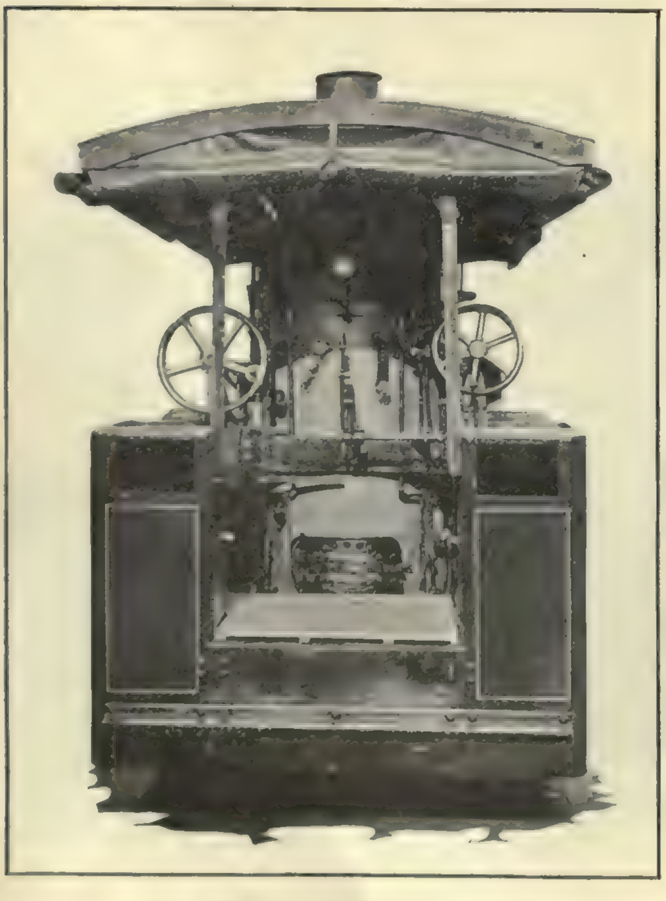
Since there has been practically no change in the design of the macadam roller during the period of about thirty years that it has been in use, the machine of a new type illustrated herewith is of especial interest.

The most noticeable feature of the roller is the vertical boiler. This rests upon the steel framework of the roller and, as nothing is bolted to it, is relieved of the strains caused by the operation of the machine. It can easily be removed for repairs without disturbing any other part of the roller and has over 50% more heating surface than the horizontal type of boiler.



NEW IROQUOIS MACADAM ROAD ROLLER WITH VERTICAL BOILER

The engine is also a separate unit which rests upon the roller framework on a three-point suspension, like an automobile engine. The drive is through a differential to the rear wheels, which may be locked for hard, straight pulls. Positive steering is obtained through a steel quadrant.



REAR VIEW OF IROQUOIS MACADAM ROLLER OF NEW TYPE

A steam scarifier is part of the standard equipment of the roller. It is adjustable to any desired depth over the full width of the roller.

The engine is more powerful than that used in the old type of roller, because of higher steam pressure and larger cylinders. The shifting of gears is entirely eliminated and the machine has the flexibility of operation of a tandem roller.

Although the machine appears high, the center of gravity is really lower than in the old type.

The roller is manufactured by the Iroquois Department of the Barber Asphalt Paving Co.

Sullivan Machinery Company Announces Appointments

The Sullivan Machinery Co. has announced the following appointments by the board of directors:

Arthur E. Blackford, formerly manager at New York City, to be vice president in charge of finance and accounting; Howard T. Walsh, vice president, in charge of sales; Gilbert K. Willson, assistant secretary, in charge of cost accounting; Nathaniel H. Blatchford, Jr., assistant treasurer; Emil A. Krevis, general auditor; Frederick W. Copeland, manager of foreign sales; Louis R. Chadwick, hitherto branch office manager at Spokane, Wash., as manager of the Company's branch at 30 Church St., New York, N. Y.; Robert T. Banks, for several years sales engineer at the El Paso, Texas, office, to succeed Mr. Chadwick as manager of the Spokane office.

Machine for Toothing and Cutting Brick

A demonstration of the use of the Schramm No. 2 compressor outfit for toothing and cutting bricks out of a brick road was recently held in Washington, D. C., before the Bureau of Public Roads, U. S. Department of Agriculture. A section of the test road maintained by the bureau was selected for repair, and the work of toothing out the bricks is said to have been neatly and quickly done. The accompanying illustrations show how the work was accomplished.

BRICK CUTTING AND TOOTHING MACHINE UNDER TEST AT WASHINGTON, D. C.

The tools used were a Schramm No. 2 portable compressor, a No. 5 chipping hammer and a point or gouge chisel, about 18 in. ling. It is important to have this chisel of good

ANOTHER VIEW OF SCHRAMM BRICK CUTTING AND TOOTHING OUTFIT IN OPERATION

length so that the operator can work the tool in a comfortable position.

The secret in cutting out the bricks is to start the chisel about 1 in. back of the end of the broken brick, chipping out small pieces so that the brick next to it is not loosened. But a few seconds are required to remove and clean one brick and after a little practice the operator can make a great saving in time over the hand method.

The Good Roads Machinery Co., Inc., of Kennett Squarc Pa., has announced the removal of its general offices from Kennett Square to 821 Bulletin Building, Filbert and Juniper Sts., Philadelphia, Pa. The change became effective on Jan. 10.

At the annual meeting of the directors of the Nash Motors Co., W. H. Alford, Vice President, was elected to the board of directors and C. B. Vorhis, General Sales Manager, and J. T. Wilson, Assistant Manager of the company, were elected vice presidents.

In expectation of a year of increased activity in building and construction, the Indiana Limestone Quarrymen's Association has been recently reorganized and expanded. H. S. Brightly, formerly of Chicago, has been appointed secretary and George B. McGrath has been transferred from Washington, D. C., and is now in charge of the Metropolitan Service Bureau at 489 Fifth Ave., New York, N .Y. C. Rolland Yanson has been transferred from Bedford, Ind., and placed in charge of the Chicago Service Bureau at 231 Insurance Exchange, Chicago, Ill. E. E. Miller, with headquarters at Philadelphia, succeeds Mr. McGrath as field representative of the association in the Atlantic states territory and W. S. Whyte succeeds Mr. Yanson.

State Highway Work in Kentucky

(Concluded from page 52)

Under the Acts of 1917, the counties were authorized to vote a tax of 20 ct. on each $100 of the assessed valuation for the purpose of constructing roads; 35 counties have taken advantage of this act.

Since 1914, the State Road Department has constructed about 2,000 mi. of road at a cost of over $10,000,000. This includes only the roads which are on the inter-county-seat system. The counties have charge of the secondary roads and no record of their construction is kept in this office, but it is a conservative estimate to consider that 1,000 mi. of these roads have been built since 1914.

With the passage of the Bankhead Bill a new stimulus was added to road construction. The General Assembly of 1920 met on Jan. 5, determined to bring Kentucky back to the place in the list of road building states which she held in 1905. The department has estimated that in order to keep pace with the development of the state's resources, 3,000 mi. of hard-surfaced roads, most of which must be of some type higher than a surface treated water-bound macadam, must be constructed in the next ten years. A system comprising the principal roads has been laid out and the Legislature has been asked to adopt this as a state system. A bill has been introduced providing $7,500,000 a year for road purposes. It has been suggested that the state vote a $75,000,000 bond issue to be retired from funds derived from the sale of motor licenses, but the majority of the Assembly seem to favor a direct tax.

The bill creating the state road system also provides for a reorganization of the Road Department and instead of having the authority divided between the counties and state, as it is under the present system of inter-county-seat roads, it declares this road system as outlined by the department to be a system of roads constructed and maintained by the state.

It is impossible to give the future policies or plans of the department at present, but it may be said that a system of state roads will be created this year and an appropriation made that will guarantee its construction within the next ten years.

State Highway Commissioner Sadler of Pennsylvania has awarded contracts amounting to $1,892,098.46 for the construction of 35 mi. of roads. The largest contract calls for 57,688 lin. ft. of concrete pavement in Delmont Borough, Salem, Washington and Hempfield Townships, Westmoreland County, on the state highway from Jeanette to New Kensington. It was awarded to the Warren Brothers Company, of Boston, Mass.

A System of Numbering Iowa's Important Through Tourist Routes has been adopted and, so far as it proves practical, the same unmbers used in neighboring states will be applied to the same routes in Iowa. The Jefferson Highway, which is No. 1 in Minnesota, will be No. 1 in Iowa and the Lincoln Highway, No. 6 in Illinois, will keep the same number. It is expected that the important tourist roads will be equipped with round disks bearing the numbers and the words, "Primary Road, Iowa."

The Indiana State Highway Commission has received from Attorney General Stansbury of that state an opinion to the effect that county commissioners have no authority to request the State Highway Commission to superintend the construction of county or township highways unless such supervision is asked in a petition signed by at least 50 persons who will be taxed or assessed for the improvement. The opinion also held that county commissioners have no authority to pay any claims for construction unless the work is certified by the State Highway Commission's inspector, who has full authority to order defective work removed and the proper construction carried out in accordance with the plans and specifications.

Plans for the Bridge over the Missouri River between Bismark and Mandan have been approved by A. L. Ostrander, of Minnapolis, Minn., Acting Engineer, District No. 4, U. S. Bureau of Public Roads. The structure will cost about $1,000,000 and federal aid will be asked to the extent of half the cost.

MEETINGS

Calendar of Coming Meetings

Feb. 9-13—American Road Builders' Association—Seventeenth Annual Convention, Tenth American Good Roads Congress and Eleventh Good Roads Show under the auspices of the A. R. B. A., 1st Regiment Armory, Louisville, Ky. Secretary, E. L. Powers, 150 Nassau St., New York, N. Y.

Feb. 10-12—American Wood-Preservers' Association—Sixteenth annual meeting, Chicago, Ill. Secretary-Treasurer, F. J. Angier, Baltimore & Ohio R. R., Baltimore, Md.

Feb. 18-19—Associated General Contractors of America—Annual Meeting, Chicago, Ill. Secretary, 111 West Washington St., Chicago, Ill.

Feb. 26-28—Southern Appalachian Good Roads Association.—Tenth Annual Meeting, Asheville, N. C. President, A. D. Williams, Parkersburg, W. Va.

Apr. 12-17—United States Good Roads Association—Eighth Annual Convention, Hot Springs, Ark. Director General, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

Apr. 16-17—Bankhead National Highway Association—Fourth Annual Convention, Hot Springs, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

N. J. ASSOCIATION OF COUNTY ENGINEERS

At the annual meeting of the New Jersey Association of County Engineers, held at the Engineers' Club, Trenton, on Jan. 20, 1920, the following papers were read: "A Method of Numbering Highway Bridges," by Harry F. Harris, County Engineer of Mercer County; "The Attitude of the Board of Commerce and Navigation on Reconstructing Bridges over Navigable Streams," by J. J. Albertson, County Engineer of Camden County, and "Needed Reforms in Highway Work," by James Logan, County Engineer of Burlington County.

The following officers were elected for the ensuing year: President, Thomas J. Wasser, County Engineer of Hudson County; Vice President, A. H. Nelson, County Engineer of Atlantic County; Secretary, Harry F. Harris, County Engineer of Mercer County; treasurer, Alvin B. Fox, County Engineer of Middlesex County.

The first annual meeting of the National Federation of Construction Industries will be held March 24 and 25, 1920, at the Hotel Sherman, Chicago, Ill. The Federation has been formed for the purpose of extending construction and improving conditions in the combined construction industry, and its activities are planned to be broad and to cover all phases of the field.

Under the auspices of the Engineering Department of the University of Texas and the State Highway Department, a convention of highway engineers and road builders will be held Feb. 17 to 21, inclusive, at Austin, Texas. An interesting program is being arranged and the question of forming a State Highway Organization will be discussed and voted upon at the meeting. Communications should be addressed to Prof. R. C. Tyler, University of Texas.

PERSONAL MENTION

A. D. Butler has been reappointed city engineer of Spokane, Wash.

George F. Winn has been appointed city engineer of Nashua, N. H.

Ezra E. Bauer has been appointed assistant in highway engineering at the University of Illinois.

Thomas B. Wyman, formerly mayor of Munising, Mich., has been made city manager of Painesville, Pa.

J. W. Greer has been appointed city manager of the City of Tallahassee, Fla., resigning as city manager of Bryan, Texas.

L. G. Owen, of Owen & Plummer, Inc., Johnstown, Pa., has been appointed borough engineer of Brownstown Borough, Cambria County.

O. A. Seaward has been appointed to fill the vacancy made by the resignation of C. L. Sherer, for 15 years city engineer of Beaumont, Texas.

H. B. Bilford has been appointed a resident engineer of the Ohio State Highway Department, having resigned his position as a resident engineer with the Illinois State Highway Department.

N. H. Davis, head of the civil engineering department of the University of Florida, has been appointed by the county commissioners of Smith County, Tennessee, chief engineer in charge of road construction.

Vernon H. Taggett, of Morrison, Ill., for the past six years superintendent of highways of Whiteside County, Ill., has been appointed road building engineer for Emmet County, Michigan, at a salary of $3,300 per year.

Robert A. Caughey, formerly Associate Professor of Civil Engineering at Pennsylvania State College, is now associate professor of structural engineering in the civil engineering department of Iowa State College.

Charles Ash, Resident Engineer on construction of the Scioto River Bridge, Broad St., Columbus, O., has been appointed deputy commissioner in the State Highway Department and detailed to the Bridge Bureau.

J. H. Kirkham has been appointed bridge engineer of the South Dakota State Highway Commission, resigning his post of professor of structural engineering and chairman of the engineering faculty of Iowa State College.

William W. Cox, who has been connected with the Michigan State Highway Department for the past ten years, has been appointed to take charge of extensive road building operations to be undertaken in St. Clair County, Michigan.

Robert C. Terrell, Acting Director of the Department of Civil and Highway Engineering at the University of Oklahoma, will succeed Max L. Cunningham as state highway engineer of Oklahoma. Prof Terrell is vice president of the A. R. B. A. from the Central District and was Commissioner of Public Roads of Kentucky from 1912 to 1916.

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

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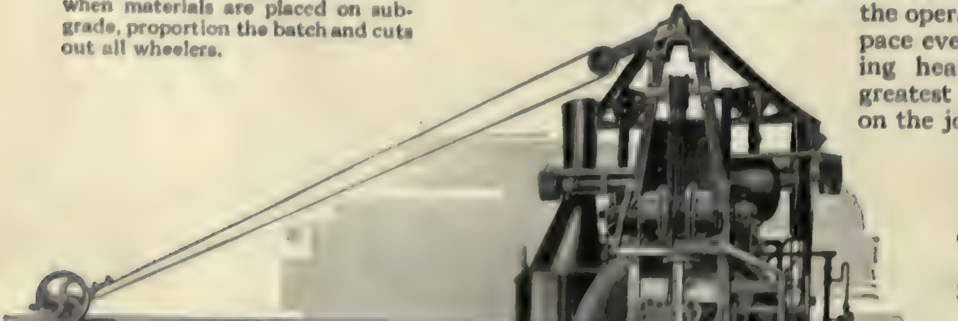

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THE HIGHWAY CONTRACTOR AND ROAD BUILDER

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6

Roads in Westchester County, New York

BY CHARLES E. FOOTE

A state road in the northern part of Westchester County, New York, about 50 mi. from New York City, known as the Mohegan-Mahopac road, presents some interesting features.

The road was completed by the state late in the fall of 1917, after the former contractors had given up the work, about two thirds finished, on account of the increased and increasing cost of labor and material. The final work was well done, and the road, practically without attention, is in excellent condition after more than two years of heavy traffic.

A little more than ½ mi. east of Lake Mohegan Post Office, the road traverses a swamp for a distance of about 400 ft. This swamp is the northern end of Lake Mohegan, a body of water about a mile long and half that wide, and it is locally supposed that the outlet of the lake in past ages was through this swamp, which is now overgrown with large trees and underbrush. It is known that when the surface of the lake rises to a given point, it drains away to the streams leading to the north and west on their way to the Hudson River.

Near one end of this 400-ft. stretch, a section about 100 ft. long sinks sharply down and up again, making a veritable hollow 2½ to 3 ft. deep in the middle. The road at this point was built on an exact level, so that the depression is true sinkage. A somewhat uncommon feature is that the road retains its contour perfectly, and is not—or was not before it was covered with snow late in December—cracked at the ends nor elsewhere in the sunken portions.

It develops on inquiry, that the old country roads which formerly covered that route had been a source of trouble to the township and community annually for more than a century. Innumerable loads of earth and boulders and rock had been dumped into the "sink holé" nearly every spring, making a good road for the season, only to find a repetition of the operation necessary the next spring. When the state highway engineering force came on the ground to make the surveys for the state road, they were strongly advised by the residents to make a detour of a few hundred feet around the end of the swamp; but it was then the dry season and they decided otherwise.

The outcome will be interesting to note. Whether the ends will break loose and the road sink out of sight when the thaw and high water come in the spring is an active subject of local discussion. Certain it is that it will be submerged, at least a foot, with the advent of the spring freshets. In its favor it may be stated that the road is of excellent asphalt macadam construction, and will hold if the subgrade furnishes any considerable sustaining factor.

It is idle to discuss what might have been done in this instance. The detour, so strongly advised, would have destroyed the beauty of the straight stretch of handsome highway, and would have cost something for a new right

SECTION OF MOHEGAN MAHOPAC ROAD ON GRADE OF 4½ PER CENT., SHOWING SURFACE

THE MOHEGAN MAHOPAC ROAD ABOUT ½ MILE EAST OF MOHEGAN. COUNTRY BLACKSMITH SHOP OPPOSITE of way. There are some who think that a number of the medium sized trees with which the swamp abounds could have been cut and hauled to position transverse to the roadway, perhaps not close together enough to give a corduroy effect but close enough to sustain the road structure. It is even suggested that some such course as this will yet be necessary, when a new road is superposed on the present one; that the boles and branches, alternately projecting each way far out over the swamp, will form the one sure means of creating a lasting foundation.

Another feature in the construction of the Mohegan-Mahopac Road is its contribution to the concessions made to the horse-drawn traffic, considerable of which still exists.

The region is more or less hilly, and throughout most of its course is lined with large trees, principally maples, the foliage of which interlaces overhead, giving a pleasing effect. While there are no grades exceeding 5%, though those from 3½ to 5% are frequent. On these grades the surface instead of screenings and asphalt is finished in a different manner, and in one for which, so far as may be known at this time. no specification existed or exists.

Stones ranging from 1¼ to 2½ in. appear in the surface firmly held in place by an unusually hard asphalt. Members of the force that finished the road state that the contractor, who was working for the state on a cost plus arrangement, actually tried to see how good a road he could build, irrespective of cost, and that on these grades there were actually placed 4 to 5 in. of the large sized surfacing stones, and as much asphalt as the stone surfacing would hold, whether it were 2 or 3 gal. per square yard.

At all events, these grades are most excellent examples of what can be accomplished by careful construction. The coarse stone was carefully rolled so that the surfacing should not be rough enough to damage tires, but still rough enough to afford good footing for horses hauling heavy loads. It furnishes also, a perfect protection against skidding.

Likewise, the man who operated the road roller on that work declares that in a dozen years' experience he has never seen a road so well rolled, longitudinally, diagonally and transversely. It was rolled to a condition of absolute compaction. The excellence of the rolling is indicated by the fact that there is not a soft or imperfect spot in the entire road, except at the "sink hole" previously mentioned, and that does not apply to the surfacing or to the metalling of the road, but to its foundation.

The stone for the road was crushed along the right of way. It is a stony country, and huge boulders were blasted and broken up and then crushed in a crusher erected at the roadside. The sand for the concrete culverts was also taken from sand pits in the neighborhood. The upper end of the road nearest Lake Mahopac was not completed till midsummer, 1918.

From Peekskill, on the Hudson River, a first-class asphaltic macadam state road was built to Lake Mohegan several years ago. A suburban trolley line runs along the roadside. Passing over hills and through valleys, but with a generally enhancing elevation, a height of about 600 ft. is reached at Lake Mohegan Inn, and Post Office, the end of the trolley. Continuing from here as the Mohegan-Mahopac Road, the little hamlet of Shrub Oak is reached in about 2 mi., and 2½ mi. further is Jefferson Valley, on the shore of Lake Osceola. About 3 mi. further the road turns northward crossing the line into Putnam County 2 or 3 mi. from Lake Mahopac.

The road is metalled only to the Putnam County line, but the remaining section is kept in good condition for motor traffic by the local authorities until the state shall complete it; that is, in good condition except for about three weeks in the spring, when the break-up takes place. It is expected that the state will complete the gap this season.

Before the road was built, it is estimated that there were 20 or 30 automobiles owned along its line; today there are nearly 500. Then there were no motor trucks. Now there are scores of them, and most farmers' deliveries are made with them. Milk is taken from this section to Peekskill in large quantities daily, to meet the New York milk trains, and farmers load trucks high with apples and other fruits and vegetables and deliver in the New York markets.

During the late summer and fall seasons, when both agricultural and touring activities are at their height, a traffic of 1,000 to 1,500 vehicles a day over this road is not uncommon. Frequently as many as 400 or 500 pleasure vehicles can be seen in the course of a summer evening. It is expected that a motor omnibus line, running on a regular schedule, will be put into operation between Peekskill and Jefferson Valley this coming season.

Incidentally, Westchester County, which has probably the largest mileage of improved highways of any ex-urban county in the United States, is making a serious effort to secure wider roads. The present width of state and county roads, 16 ft., is considered too narrow for the traffic to which they are subject on account of the proximity to Greater New York.

Not only automobile clubs, but business men, physicians, dairymen, farmers, market gardeners and joy riders, are all joining in the effort to secure legislation, if necessary, but at any rate to achieve the result.

Traveling at an ordinary rate of speed, it requires careful driving on the winding roads of Westchester to prevent either sideswiping or getting out on the berm. When originally constructed the berms were, of course, in good condition, but wear and weather, especially along the older roads, have interferred with their excellence, so that driving on them with an outside wheel is likely to produce ill results. Besides, it frequently occurs that three autos chance to come together, and some of the overgrown trucks of the present day carry "hang-overs" which take up a great part of the 16-ft. roadway.

It is considered that 20 or 24 ft. is the narrowest that should be built in the county; and many people are figuring on the cost of a 2-ft. strip along each side of the present roads. It is not thought that the expense will be excessive, there being scarecly any grading, and the addition of but a small amount of material and labor will be all that is necessary.

It seems probable that new construction and reconstruction in Westchester County will be of the greater width.

What may be done with existing roads is an open question.

———OOO———

The Carnegie Corporation of New York has recently announced its purpose to give $5,000,000 to the National Academy of Sciences and the National Research Council and it is understood that a part of the money will be used to erect in Washington a home of suitable architectual dignity for the two organizations.

The Primary Road Fund of Iowa showed a net balance of $5,046,770.36 on Jan. 1, 1920, according to a recent report. This fund is made up from the proceeds of automobile registration fees and the state allotment of federal aid funds. A system of roads was established by the last General Assembly and was selected by county officials and the State Highway Commission, embracing 6,400 mi. of the main highways of the state and connecting every town of 1,000 or more population. The primary road fund is used for improving this system of highways.

A Comprehensive System for Numbering County Bridges[*]

By HARRY F. HARRIS[†]

It seems that for years past the counties generally have been extremely negligent in the proper maintenance of their bridges and culverts. As we well know, this has been due principally to the fact that bridges were originally built to sustain heavy horse-drawn vehicles or an occasional steam roller and answered that purpose very well, but with the tremendous development of the motor truck for transportation purposes it at once became imperative that the counties have exact information as to the condition of each and every bridge under their jurisdiction. Moreover, the counties were required by a recent legislative act to plainly mark each individual bridge with its capacity.

Mercer County along with many of the other counties, was confronted with the problem of getting these data together. An up-to-date system of cataloging, indexing and compiling all the important information relative to the county bridges had never been installed.

In order to properly compile and tabulate our bridge data the first requisite is the adoption of a system of numbering. This should be as simple as possible, and at the same time it should be elastic and comprehensive.

For his own needs, the speaker, after devoting some study to the subject, decided to utilize the so-called Dewey index system, or to be more accurate, a modification of it. The plan is so logical, simple and adaptable to so many different conditions, that it was thought a few words concerning it might be helpful to some of the other counties, should they desire to adopt some such system for similar work.

The "Dewey System" was first devised by the Director of the New York State Library, and was intended primarily for libraries, where it met with instant success, it having been named for the originator, Mr. Melvin Dewey. It has since been developed so that it is applicable to many different forms of business and has been found to be especially valuable in engineering work.

An elaborate explanation of this system can be found in Davies' "Engineering Office Systems and Methods," by those who are especially interested. The following is quoted from that work:

> **Explanation of the Decimal System**
>
> The essential characteristic of the Dewey System is its method of division and subdivision. The entire field of knowledge is divided into nine chief classes numbered by the digits from 1 to 9. Matter of too general a nature to be included in any of these classes is put into a tenth class and indicated by 0. The following are the primary classes of the Dewey System:
>
> 0. General Works
> 1. Philosophy
> 2. Religion
> 3. Sociology
> 4. Philology
> 5. Natural Science
> 6. Useful Arts
> 7. Fine Arts
> 8. Literature
> 9. History
>
> Each of these classes is again divided into nine divisions, with a tenth division for general matter, and each division is separated into nine sections. The sections are again subdivided and the process may be carried as far as desired. To show clearly the working of the system the division of Class No. 6 (useful arts) and the section of division No. 2 of this class (engineering) are given.
>
> 600. Useful Arts (General)
> 610. Medicine
> 620. Engineering
> 630. Agriculture
> 640. Domestic Economy
> 650. Communications and Commerce
> 660. Chemical Technology
> 670. Manufactures
> 680. Mechanic Trades
> 690. Building
>
> 620. Engineering (General)
> 621. Mechanical
> 622. Mining
> 623. Military
> 624. Bridge and Roof
> 625. Road and Railroad
> 626. Canal
> 627 River and Harbor
> 628. Sanitary Waterworks
> 629. Other Branches
>
> It will seem that the first digits give the class; the second, the division; and the third, the section. Thus 625 indicates section 5 (railroad engineering) of division 2 (engineering) of class 6 (useful arts). For convenience a decimal point is inserted after the section digit. Further subdivision is indicated by digits following the decimal point. For example 625.2 is the number indicating rolling stock; 625.23 passenger cars; 625.24 freight cars, etc.
>
> **Uses and Advantages of the Decimal Classification**
>
> The decimal classification may be used to advantage in the indexing and filing of notes and memoranda, clippings, drawings, catalogues and books. For this purpose the decimal system possesses certain important advantages over the alphabetical system. (1) It groups allied subjects. For example, suppose the alphabetical arrangement to be applied to a case of catalogues. The catalogs of the various machine tools, as planers, lathes, drills, hammers, etc., would be scattered throughout the case. With the decimal system, on the other hand, all these catalogs would be grouped together under the class number 621.9. (2) Unless an elaborate system of cross reference is used, the alphabetical scheme is ambiguous; in many cases there is doubt as to what letter should be given a subject. For example, take the item, "Automatic pneumatic block signals." This might almost equally well be indexed under "A," "P," "B," or "S." With the decimal system this item has its one number 656.256.4. (3) The decimal system has the advantage of flexibility and indefinite capacity for extension. For the indexing of books and catalogs only the main division and sections will, in general, be found necessary; but for card indexes of technical literature the most minute subdivision must ordinaryily be used.

In adapting this idea to our county work it was first decided to subdivide the county into nine districts and for convenience, the townships were used for this purpose, each district or township being assigned a key number. For instance, all bridges in Hopewell Township begin with 200; all in Princeton Township with 300; in Ewing Township with 400; in Lawrence Township with 500, etc. Similarly all bridges in the City of Trenton begin with 100.

As the next step we gave to each principal stream within the county a key number which was to follow the district key, that is, all bridges across the Assunpink Creek bear the number 4, regardless of the township or district. Likewise, if a bridge were across the Millstone River it would have number 6, and if across Stony Brook, 3. In other words, these numbers all occupy the tens column. Now, should the stream be the principal tributary of the Assunpink or Millstone it would bear first, the index number of the township, next the key number for that stream and the following digit would then indicate whether it was a tributary of that stream. Should the bridge cross the principal stream itself and not be on a tributary at all, the next figure very logically becomes a cipher.

Thus we have in the first three figures the township, stream and tributary fixed. We then used a period, the next figure indicating the number of the bridge on the tributary or main stream. That is to say, the numerical arrangement of the bridge itself is taken care of at that point, the numbering commencing at the mouth of the stream or tributary.

To give a concrete example: A bridge bearing the number 541.7 shows that this bridge first, is in Lawrence Township, because it is among the 500 series. Next, being in the 40 series places it on the Assunpink or a tributary, while the next figure shows that the structure is not bridging the Assunpink direct, but a tributary thereof, and furthermore is the first tributary in that township, counting from the mouth of the stream. Now we have arrived at the decimal point. The figure following the point shows the relative position of that bridge to all other bridges on that particular stream.

The question may arise as to how a bridge would be numbered which spans a stream forming the boundary between two townships. This very frequently occurs. We meet this situation by adding one more number in the hundreds, bearing the key number of one of the townships and separating this from the adjoining township key figure by a dash, thus 6—540.3 showing at once that this is a township line bridge, and at the same time both townships are indicated and the additional information as to stream location.

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[*] Paper presented at the annual meeting of the New Jersey Association of County Engineers, Trenton, N. J., Jan. 20, 1920.

[†] County Engineer of Mercer County, New Jersey.

In order not to complicate the system unduly, it is well not to carry the refinements to extremes. This is particularly true if you attempt to carry the tributary numbering too far. The principal point in favor of the system, however, is the fact that the geographical location of a structure automatically fixes its number. Or conversley, if reference is made in a resolution or a report to bridge No. 740.1, as an example, you immediately are able to locate this on your index map to within a very small area without effort, while if all the bridges in the county were numbered consecutively it might take considerable time to search for its location, especially where the number of bridges might exceed 1,000.

If one desired, the first set of numbers could be omitted altogether, and as an alternative letters could be substituted for the township keys. For instance, the stream key can be prefixed by "Ho," indicating Hopewell Township; "P," indicating Princeton Township; "E," indicating Ewing Township; "L," indicating Lawrence Township; "Ha," indicating Hamilton Township; etc.

This would eliminate the necessity of fixing the key figure in the mind for indicating townships. This is, however, a matter of detail. Each county has its own pecularities which have to be worked out as separate problems.

To the several advantages which have already been noted the ease with which new numbers can be inserted or interpolated might be added; also the ease with which the duplication of numbers can be avoided by reason of the fact that each series of numbers is confined to a very small area. As to the disadvantages, these seem to be few. At first sight the system may seem to be considerably complicated, but upon giving it some little study it will be seen that this is not the case. One important disadvantage which might be cited is that of numbering inter-county bridges where several adjoining counties would adopt this system. However, it would seem that by cooperation of the county engineers this could be very readily adjusted.

In this county we propose, after a survey has been completed of all the bridges in the county, to tabulate the information collected by the field corps on a card index system—modelled after the system now in use by Mr. McClave of Bergen County. On one side of the card appears information relative to the cost of the bridge, the contractor, date when built and other pertinent data, and on the reverse side a sketch showing the type of bridge, principal dimensions of the bridge structure itself and the masonry, also the height above the water level, and the present capacity of the bridge.

———ooo———

The Authorities of Steel County, Michigan, plan to expend $134,305.10 for road improvements during the coming season. Plans for the work were outlined at the recent annual meeting of the county commissioners.

In New York State during 1919 Automobiles Caused the Death of 1,270 Persons, according to the annual report of the National Highways Protective Society. It was further stated that of these deaths, 783 occurred in New York City. In 1918 the casualties in the state were 1,189, of which 748 were in New York City. In comment on these figures, Col. Edward S. Cornell, Secretary of the society, said that further legislation must be enacted in New York to prevent motor fatalities from increasing.

Needed Reforms in Highway Work

By JAMES LOGAN†

The Federal Government states that there will be available $633,000,000 for road improvement during the year of 1920. This enormous expenditure for roads is appalling; every effort should be made to see that this money is economically expended, otherwise it will result in highway engineering being discredited.

There are three parties interested in a highway contract, the engineer, contractor and public. They are stated not in the order of their importance, but in the order of requiring the most reforms, and will be so discussed.

Engineer: There should be no charge or deposit for plans and specifications. These documents should be furnished to contractors without cost. All guarantees should be abolished. Materials should be inspected at the source of supply. Contracts should be awarded early. Retained percentage of estimates should not exceed 10%. Certified checks should be for a fixed sum, about 2% of the bid, and they should be returned within five days after receipt of bids. Final acceptance and payment should be made on portions of completed sections of road which are continuous, prior to the entire completion. Payment should be made to contractor for cost of material in stock piles.

Contractor: More capital, better equipment, cooperative handling of employees and labor are necessary. Detours to be maintained by contractor with larger and plainer signs, which are to be illuminated at night. Where sections of road are closed to travel, watchmen to be maintained day and night to direct travel and prevent people from damaging work. After roads have been opened, detour signs to be promptly removed so that there will be no confusion. Only contractors with experience, ability and sufficient capital should be awarded contracts. Contractors should plan and equip themselves to complete their work on time.

Public: The traveling public should be educated through the press and by notices on large signboards explaining the necessity of detours and why they will damage the road if they pass the barriers.

In this brief paper it will be seen that the engineer appears to be mostly at fault. When drawing specifications the engineers are frequently not permitted by statute to exercise their judgment. In order to have reforms, it will be necessary to enact legislation. There are, however, a good many places where specifications should be changed that would result in good work at less cost to the taxpayer. The working season for road construction is shorter than that of any other activity, and it seems to the writer that that is a matter which should be thoroughly investigated to see if some means can not be devised whereby some of the work can be carried on during the entire year, as, for example, heavy grading, the assembling of plant and the obtaining and storing of materials, the permitting of the laying of some kinds of pavements in colder weather than is now permitted in some specifications.

It is incumbent upon the highway engineer to take more interest in civic affairs, the reviewing of proposed legislation and even the drafting of same wherever it affects highway construction, for if there are laws on statute books which call for a needless expenditure of money by a contractor, that

(Continued on page 84)

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*Paper presented at the annual meeting of the New Jersey Association of County Engineers, Trenton, N. J., Jan. 20, 1920.

†County Engineer of Burlington County, New Jersey.

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

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Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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ROADS AND ROAD WORK IN WESTCHESTER COUNTY, NEW YORK

The last few paragraphs in the article printed on the opening pages of this issue open up a most important and interesting question—the requisite width of roads in Westchester County, New York.

According to the article, the present width of the roads there is 16 ft., and this is considered too narrow, a width of from 20 to 24 ft. being considered the least that is required by the traffic which has to be carried. It is also stated that automobile clubs, business men, dairymen, farmers and motorists are united in an effort to secure greater widths than the present ones, and that it is probable that "new construction and reconstruction in Westchester County will be of the greater width."

That a width of more than 16 ft. is necessary in that particular section seems quite obvious. Westchester County lies directly north of New York City, extending from the Hudson River on the west to Long Island Sound on the east. Its roads naturally carry a very heavy commercial traffic between the city and the country to the north and northeast. They also carry a very heavy pleasure car traffic, for every automobile route from New York City to the resorts in New England crosses the county. In fact, a section of the Boston Post Road—the shore route to Connecticut and the other New England States—is one of the most heavily traveled roads in the East.

Another thing to be considered is that many of the county's main roads carry a 365-day traffic. And in the spring, it is particularly essential that the paved width of roads be great enough so that vehicles in passing or meeting will not have to get out on the soft shoulders where the danger of getting mired is great.

REFORMS IN HIGHWAY WORK

Few papers of equal length contain so many suggestions for bettering conditions in the road building field as does for one entitled "Needed Reforms in Highway Work," which was read by James Logan, County Engineer of Burlington County, New Jersey, at a recent meeting of the couty engineers of that state. The paper is printed in full on other pages of this issue, and its perusal will pay anyone interested in the broader problems of highway improvement.

According to Mr. Logan—and we venture the opinion that most road builders will agree with him—there is need for reform of all three parties interested in highway contracts—engineer, contractor and public. Mr. Logan believes that of these three the engineer stands in the greatest need. Not all engineers will agree with that, we presume, though it is likely that contractors will subscribe to it without reservation.

But whatever the relative needs of the three parties mentioned, some of the specific points made by Mr. Logan are well taken. Many of those noted in connection with the engineers are matters of long standing controversy. Most of them, if carried out, would make the contractor's lot an easier one, and, we believe, in the long run would make for better work. The same is true of many of those noted under th head "Contractor." Fortunately, engineers and contractors are fast getting together on many of the points made, and the present outlook is most encouraging.

Mr. Logan has only one suggestion for the public. We imagine that most engineers and contractors would gladly add several more.

NUMBERING HIGHWAY BRIDGES

An ingenious scheme for numbering the highway bridges in a highway administration district is described in a paper by County Engineer Harris of Mercer County, New Jersey, which appears on other pages of this issue. Though applied to a county in the case cited, it is equally applicable to any other unit.

One of the problems forced upon highway engineers and officials by the growth of motor traffic was that of bridges. Many of the older structures—most of them, in fact—were inadequate to the greater loads that had to be carried. That meant a great amount of repair and reconstruction—much of which still remains to be done, for in many parts of the country the bridges limit the loads the roads can carry. And the first step in the work was naturally the collection and collation of data on existing bridges, carrying with it the necessity for some system of designating the multitude of structures ranging from box culverts to long-span structures of wood, steel, stone and concrete.

This last is the matter covered in the paper by Mr. Harris. The plan described by him has many advantages, one of the chief of which is that it is almost universally applicable. It would undoubtedly have to be modified to meet conditions in some places, but it is a system that readily admits of modification. The use of letters instead of digits is one modification that could easily be made were conditions such as to make it advisable. Others would suggest themselves by a study of local needs.

Needed Reforms in Highway Works

(Continued from page 82)

law will affect the cost of construction and make the work more expensive. Such a condition obviously should be remedied.

The year 1920, according to most authorities, will not see any reduction in the cost of labor or materials; therefore, all effort should be made to keep the cost of the work down by various reforms in specifications. This can be done by the engineer. Scientific planning and well organized contracts and efficient machinery will accomplish something, and this the contractor can do.

Marking, Signing and Making Safe a State Highway System[*]

By L. H. NEILSEN[†]

Under the legislation providing that the state trunk line system previously established by law should be "improved constructed and maintained under the direction, supervision and control of the State Highway Commissioner," he was also instructed to "cause all state trunk line routes to be distinctly marked by signs and guide posts of a uniform design as may be deemed necessary for the public convenience and necessity," and "to cause to be published a map of the State of Michigan showing thereon the state and county road system." Provision was also made for numbering the routes and showing the corresponding numbers on the roads shown on the maps.

Following out the provisions of this legislation several designs were considered with the result that a standard design was agreed upon, consisting of a diamond 15 in. in length and 13½ in. wide. Across the middle will appear the words "State Trunk Line" with a block "M" above and the numbers of the route shown below. For the markers to be used on telephone and telegraph poles a black letter on a white background will be used. This will also apply to markers placed on building and suitable natural objects along the roadside.

For this preliminary marking, stencils and county maps showing the roads to be numbered in each county have been prepared and instructions to the county authorities made ready to send out.

These markers will be placed on telegraph and telephone poles when they are available, both sides of each intersecting cross-roads with an occasional one in between. Three to six hundred feet before a turn in the road is reached, the white band will be widened and an "R" or "L" as the case may be, shown below the standard marker. Where a pole is not available and no buildings or natural objects will answer the purpose, cedar posts will be set up and the markers placed on them.

Standard railroad crossing signs will be shown about 600 ft. from all grade crossings. Dangerous curves will also be marked.

Although it is not the intention to maintain that portion of a route lying within incorporated cities and villages previously paved, it is very necessary that it be plainly marked through every village and city. It is our intention to place direction signs at the intersections of the routes with improved roads showing distances to the nearest town.

For the present no marking of the county road system is planned, although it is expected that a standard design for marking it will be decided upon within another year. The marking so far referred to is primarily intended for the guidance and information of the traveling public. In order to make this information most valuable, the map referred to must be provided and made available to the public. Because of the shape of the state, it was thought advisable to issue two separate folders, one showing the routes in the Upper Peninsula and the other those in the Lower Peninsula. This map is now being published and will be available for distribution by the time it will be possible to do the marking, which will be early next year.

In addition to this marking it is proposed to place mile markers on all the routes. Locations for these will be determined from automobile speedometer readings. These mile markers will consist of black diamond shaped boards with a white moulding border and the standard lettering in white. These will be set on angle iron posts. The posts will be numbered from the south to the north and from the east to the west.

At the same time that the location of the posts is determined a variety of information can be gathered and compiled for future use.

ooo

Sleighs Manufactured for Sale in Minnesota after 1921 must conform to the standard width of automobile tracks, a law passed at the last session of the Legislature fixing the width between runners at not less than 4 ft. 6 in.

The Chamber of Commerce of Alexandria, La., recently erected two large 4x12-ft. signs on the Jefferson Highway a few miles from the city, which call to the attention of tourists the fact that information will be cheerfully given at the offices of the chamber of commerce in the city hall.

The Pennsylvania State Highway Department has taken over 16.75 mi. of toll road in York and Adams Counties at a cost of $114,012.50, the cost being divided by the state and the counties, according to location. The roads will be freed at once.

Approximately 25% of the Entire Road System of Iowa will be improved during 1920, according to the plans of the Iowa State Highway Commission, as set forth in its recent report. The proposed program calls for the improvement of 1,536 mi. of highway.

The Minnesota Road and Bridge Fund, estimated at $2,150,000, will be disbursed among the various counties of that state in the near future. Because of the decrease in automobile license revenues, it is stated, the fund is less by $50,000 than that of the previous year.

Illinois is Planning to Build 1,400 mi. of concrete and brick roads in 1920, according to a recent statement by Frank I. Bennett, Director of the Illinois Division of Highways. Among the roads to be built under the proposed program are: Cairo to Carbondale, East St. Louis to Mount Vernon and Mount Vernon to Marion.

The County Commisioners of Berks County, Pennsylvania, have authorized a bond issue of $350,000 for road work in 1920. This is the only bond issue authorized during the past four years, it is stated. It is expected that another bond issue of $600,000 will be authorized for a part of the cost of the construction of the new Bingaman Street bridge, a contract for which has already been awarded.

The New Jersey State Highway Commission will assume jurisdiction over practically the entire 655 mi. of roads comprising the state highway system and will be responsible for both the construction and maintenance of the state roads. Approximately 100 mi. of the highway system were newly constructed last year and approximately 215 mi. are now under state maintenance, leaving 340 mi. of county highways to be taken over.

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[*] Paper presented at the 5th annual meeting of the American Association of State Highway Officials, Louisville, Ky., Dec. 8-11, 1919.

[†] Deputy State Highway Commissioner of Michigan.

Hard Roads Voted by Twenty-six Iowa Counties

In accordance with the law of Iowa requiring a vote by the county to authorize the board of supervisors to proceed with the hard surfacing of roads, 26 counties of that state have voted for the hard surfacing of those parts of the state primary road system in the counties.

Thirty-nine counties voted on the question and thirteen rejected it. Counties voting for hard surfacing were: Allamakee, Benton, Black Hawk, Buchanan, Corro Cordo, Clay, Clinton, Des Moines, Dickinson, Emmet, Floyd, Greene, Hancock, Johnsón, Kossuth, Linn, Lyon, Marshall, O'Brien, Osecola, Palo Alto, Plymouth, Polk, Scott, Sioux and Woodbury.

Out of a total votes cast of 136,523, those favorable were 77,355 and those against, 59,158.

Nebraska Road Institute

The third Nebraska Road Institute will be held March 1, 2, 3, 4 and 5, 1920, on the city campus of the University of Nebraska. This institute will be conducted by the College of Engineering of the University with the cooperation of the Nebraska Department of Public Works and a number of prominent Nebraska road builders.

The object of the institute is to aid in the dissemination of knowledge of the construction and maintenance of roads and bridges and of materials used in their construction, and in view of the fact that approximately $5,000,000 will be available for use in building the Nebraska state aid road system in 1920, it is predicted that the event will be an especially important one. Some of the subjects that will be discussed are: Organization of State Highway Departments;Bridges; Culverts; Earth Road Construction and Maintenance, and Motor Transportation. There will also be an inspection of the actual work being done in Lancaster County.

Amendment to State Road Law Urged by Governor of New York

Proposed Law Would Make Counties Share Cost of Maintenance of State Highways and Construction of Federal Aid Roads

Radical changes in the state highway law to lessen the cost of the maintenance of state roads were urged in a special message to the New York Legislature by Governor Smith. Four important recommendations were made, viz: that the law be changed so that counties share in the cost of road maintenance; that counties bear a part of the cost of the construction of federal aid roads; that the law be amended so that after the exhaustion of present bond funds, highway construction be paid from current revenues, and that an appropriation be made to meet the allotment made to New York State of federal funds for federal aid highways.

It was also urged by the Governor that the Legislature make available the remaining $10,000,000 of the second $50,000,000 bond issue for highway construction so that the work may be continued.

Urging a pay-as-you-go policy, Governor Smith stated that at an interest rate of 4½% and a bond issue for $100,000,000 for 50 years, the total cost to the state is $256,827,500, a sum 150% greater than the original loan. Commenting upon these figures, he said:

"As the interest and amortization charges total $158,827,500, it is wiser for the state to expend this sum for actual highway construction than to pay it to the holders of bonds.

"So long as the state pays the maintenance costs," he continued, "an incentive is created for the boards of county supervisors to favor the cheaper and less durable types of construction in order that the counties may secure a larger mileage from available funds. If the counties were required to pay their share of the costs of upkeep, especially reconstruction, they would be encouraged to give more thought to permanence of original construction, which would result ultimately in large savings to the state."

In the building of federal aid highways, it was urged that the division of costs be made as follows: Federal Government, 35%, state 35%, and county 30%.

Ninth Annual Road School of Wisconsin Highway Commission

Many Important Road Topics Taken Under Consideration—Exhibition of Equipment and Materials Extensive and Successful

The ninth annual Road School of the Wisconsin Highway Commission was held at Madison, Wis., on Jan. 26, 27, 28, 29 and 30, 1920, in the Assembly Chamber of the State Capitol. On Monday morning, Jan. 26, guests registered at the general offices of the Wisconsin Highway Commission and at 2:30 p. m. the meeting was formally opened by the address of welcome on behalf of the state by Emanuel Philipp, Governor of Wisconsin. Chas. J. Hahn, President of the Wisconsin Highway Commissioners' Association responded for the Road School. Several papers on road work followed and in the evening motion pictures were shown dealing with phases of highway construction.

The morning and afternoon sessions of Tuesday, Jan. 27, were devoted to the presentation of papers and group meetings for the consideration of road construction problems. In the evening motion pictures were again exhibited.

Wednesday, Jan. 28, was held as "Administration Day," and the papers presented at both sessions dealt with the various questions arising in the administration of the highway system. An interesting lecture on "The History of Firearms," was given in the evening by J. G. D. Mack, State Chief Engineer. Following this meeting the Good Roads Association of Wisconsin held its annual meeting in the Assembly Parlor.

Papers on highway maintenance were considered on Thursday, Jan. 29, at both sessions. In the evening at 6:00 the ninth annual dinner of the Wisconsin County Highway Commissioners' Association was held with Frank Cannon as toastmaster.

County Highway Commissioners' Day was observed on Friday, Jan. 30, and the sessions of the day were occupied with the discussion of methods and policies in the carrying out of county highway work. The business meeting of the association was held at 7:00 p. m., followed by the address of the president, reports of committees and the election of officers.

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A Continuous Modern Highway from New York City to Atlantic City, N. J., will be in operation when the last few gaps are improved early this summer. At the present time motorists from New York find an excellent city pavement from New York to Elizabeth, N. J. At the southern city limits of Elizabeth, State Highway Route 1, running to Trenton will be completed May 1, it is announced. Work on the remaining gap between Trenton and Absecon is also being done and will be completed July 1. From Absecon there is a boulevard leading into Atlantic City.

MEETINGS

Calendar of Coming Meetings

Feb. 18-19—Associated General Contractors of America—Annual Meeting, Chicago, Ill. Secretary, 111 West Washington St., Chicago, Ill.

Feb. 26-28—Southern Appalachian Good Roads Association.—Tenth Annual Meeting, Asheville, N. C. President, A. D. Williams, Parkersburg, W. Va.

Apr. 12-17—United States Good Roads Association—Eighth Annual Convention, Hot Springs, Ark. Director General, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

Apr. 16-17—Bankhead National Highway Association—Fourth Annual Convention, Hot Springs, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

Mississippi Valley Highway Departments

A joint conference on concrete road construction was held by the Association of Mississippi Valley State Highway Departments in the Red Room of Hotel LaSalle, Chicago, Ill., on Feb. 3 and 4. Motion pictures dealing with design and construction methods were given in the evening of Feb. 3, and on Wednesday, Feb. 4, discussions were held on the following subjects: Methods of Letting and General Contracting; Methods and Arrangements; Who Shall Furnish the Materials?; Payments for Materials Delivered on the Roads; Unloading Aggregate from Cars; Producing Materials Locally by Portable Plants; Plants and Plant Layouts; Bulk Cement and Cement Storage; Various Haulage Methods; Stock Piles, When and Where?; Preparing the Subgrade; The Forms; The Mixer; Finishing by Hand or Machines; Curing; Acceptance and Payments.

At the annual meeting of the Indiana Engineering Society, held Jan. 23 and 24 in the Claypool Hotel, Indianapolis, Ind., L. H. Wright, Chairman of the Indiana Highway Commission, gave an address on "Indiana Highway Problems." Among other speakers was Prof. G. E. Martin, of Purdue University, who talked on "Highway Lessons of the World War." An open discussion was also held on the problem of the county surveyor's office.

The next convention of the Vermont Society of Engineers will be held at Hotel Vermont, Burlington, Vt., on Mar. 10, 1920.

PERSONAL MENTION

Arthur Parker has been appointed city engineer of Cheyenne, Wyo.

George S. O'Dell has been appointed city engineer of South Charleston, W. Va.

E. H. McMillan has been appointed county engineer of Gilmer County, West Virginia.

James F. Platt has recently been appointed chief engineer of the Wyoming State Highway Department.

George E. Martin, Professor of Highway Engineering at Purdue University since 1904, has accepted a position in the road department of the Barrett Co., New York City.

C. A. Bingham, for the past five years city manager of Norwood, Mass. has been appointed to a similar position in Watertown, N. Y.

John F. Buckner, formerly city engineer of Cleburne, Texas, has been appointed secretary to the Rush County, Texas, Highway Commission.

A. W. Mahon has resigned as state engineer of Montana and as a member of the Montana State Highway Commission to enter private practice.

William Easby, Jr., has resigned as professor of municipal engineering in the University of Pennsylvania and will engage in private practice in Philadelphia.

Lieut. H. J. LaLonde who has been recently discharged from the 71st Field Artillery, has taken a position with the St. Louis office of the Portland Cement Association.

Major Bjarne H. Graff has entered upon his duties as division engineer of the first district of the Georgia State Highway Commission, with headquarters at Savannah.

Prof. Robert W. Thoroughgood, of the Delaware State Highway Department, has succeeded Prof. Allan R. Cullimore as head of the Civil Engineering Department of Delaware College.

Harry C. McClure has accepted a position with the Toledo Scale Co., as engineer of maintenance and construction, resigning his position as commissioner of engineering and construction for the city of Toledo, O.

William S. Caruthers, formerly Division Engineer of the California Highway Commission, has been granted a year's leave of absence to undertake the duties of Sacramento County Highway Engineer, succeeding R. M. Morton.

Mace Moulton, Jr., who for the past six years has been New England Sales Manager for the United States Asphalt Refining Co., has formed the firm of Mace Moulton, Jr., Inc., with offices in Boston, to handle bituminous road materials.

Prof. R. B. Ketchum, Dean of the Department of Civil Engineering, University of Utah, has been granted a year's leave of absence to become the chief engineer of the Soldiers' and Sailors' Mmorial Bridge across Parleys Canyon on the Bonneville Highway.

Chas. E. Fowler, a bridge and consulting engineer of New York, is engaged on preliminary work in planning the proposed suspension bridge across the Detroit River, connecting Detroit and Windsor. It is estimated that the bridge will cost $28,000,000 and require four years for construction.

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State Highway Department of Ohio plans to contract for the improvement of about 700 miles of roads during the coming season.

More than $30,000,000 Will be Available for road and bridge improvements in the State of Iowa. Most of the paving will be brick and concrete.

According to Present Plans, between $5,000,000 and $8,000,000 will be expended for road improvements in Oklahoma this year. Contemplated work involves gravel, concrete, brick and macadam construction.

At a recent Luncheon of the Young Men's Division of the Chamber of Commerce of Kansas City, Mo., J. Frank Smith, Manager of the Good Roads Association of Greater Kansas City, stated that $100,000 were needed to conduct the campaign of the association in a big way for the coming year. He also stated that the association would support the proposed constitutional amendment authorizing the Missouri Legislature to float a bond issue of $60,000,000 to build a system of state roads.

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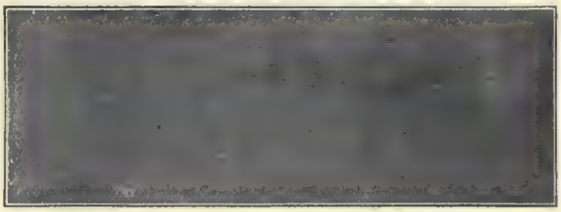

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Old Series. Vol. LVIII
New Series, Vol. XVIV

NEW YORK, FEBRUARY 18, 1920

Number
7

The Seventeenth Annual Convention of the American Road Builders' Association

The Seventeenth Annual Convention and Eleventh Good Roads Show of the American Road Builders' Association were held at the Jefferson County Armory, Louisville, Ky., on Monday, Tuesday, Wednesday, Thursday and Friday of last week —February 9 to 13, inclusive. In the following paragraphs is a chronological report of the proceedings. A description of the exhibits at the show will be found on other pages.

Owing to absences of some of the speakers because of the prevailing illness, several of the papers and committee reports appearing in the program as printed in the issue of Feb. 4 were presented by title only. They will appear, however, in the "Proceedings" of the Association.

MONDAY, FEBRUARY 9.

The opening session of the convention was held on Monday afternoon and was devoted to the addresses of welcome, the presidential address and the appointment of committees. President Coleman, of the Ameriacn Road Builders' Association, presided.

In the absence of Governor Edwin P. Morrow of Kentucky, who was scheduled to welcome the convention on behalf of the state, the welcome was extended by Peter Lee Atherton, of Louisville, Chairman of the Local Reception Committee. The welcome on behalf of the City of Louisville was extended by Mayor George Weissinger Smith. Brinton B. Davis, President of the Louisville Convention and Publicity League, who who was to have welcomed the convention on behalf of that organization, was unable to be present. His place was taken by Richard Bean, Chairman of the Local General Committee.

The response to the addresses of welcome was made by the president of the American Road Builders' Association, George P. Coleman, State Highway Commissioner of Virginia. Mr. Coleman spoke as follows:

"It gives me a great deal of pleasure, on behalf of the Association, Mr. Mayor and you gentlemen of Kentucky, to thank you for the very warm and hearty welcome which you have given us to your state and to your city. Kentucky's reputation for hospitality—even the reputation, Mr. Bean, of her bankers, for hospitality—is world wide, and we are looking forward with a great deal of pleasure to meeting your citizens and we expect to enjoy our visit to your city and to your state.

"To you gentlemen, the guests and exhibitors at this meeting, I wish to extend a welcome in behalf of the Association, and to ask your assistance and cooperation in making this meeting a success. The period through which we are passing today will, in years to come, be undoubtedly known as the Road Builders' Period, a period which will be full of problems which we, as highway men, will have to solve; and it was with this thought in mind that our program was prepared. We have tried to include in that program the subjects which are of vital interest to you and to me in our work. But to make that program a success, we must have a broad discussion of the papers which are presented, and in this you gentlemen can assist us largely, for it is from these discussions that we shall reap the benefit, because you will help us to grasp the problems which are confronting us in our work. And when I say 'us,' I mean the highway engineer, the contractor, and the supply man. In the solution of these problems, we are, then, helping the citizens of the country at large. That is the work which we have before us during the week.

"I was very much impressed a short time ago by a pamplet gotten out by a good roads body in the state of Delaware. On the title page was a quotation from an author, unfortunately unknown, for I feel that he has put his finger on the most important feature of the whole thing:

"'Roads rule the world, not kings nor congresses, not courts nor constables, not ships nor soldiers; the road is the only royal line in a democracy, the only legislature that never changes, the only court that never sleeps, the only army that never quits; the first aid to the redemption of any nation, the exodus from stagnation in any society, a recall from savagery in any time, the high priest of posterity; without beginning of days or end of life. The road is umpire in every war, and when a new map is made, it simply pushes on in the great campaign of help, hope, brotherhood, efficiency, and peace.'

"To me that is the most remarkable statement that I have ever read. It should make any man rise up and feel proud that he is a road builder—that he is taking a part in the redemption of his nation, in the up-building of his country.

"Again I want to thank you gentlemen for coming to us and to ask you again to assist us."

After the addresses of welcome and the response, Credentials and Resolutions Committees were appointed by President Coleman as follows:

Credentials Committee: R. A. Meeker, Former State Highway Engineer of New Jersey, Consulting Highway Engineer, Newark, N. J., Chairman; H. E. Breed, Former Deputy Commissioner of New York, Consulting Engineer, New York, N. Y.; James H. MacDonald, Former State Highway Commissioner of Connecticut, Consulting Engineer, New Haven, Conn.; Frank B. Dunn, President, Dunn Wire-Cut Lug Brick Co., Conneaut, Ohio; J. C. Rock, U. S. Asphalt Refining Co., New York, N. Y.

Resolutions Committee: Chas. M. Upham, Chief Engineer, Delaware State Highway Department, Chairman; H. G. Shirley, Secretary, Highway Industries Association, Washington, D. C.; C. P. Fortney, Chairman, West Virginia State Roads Commission; Frank Page, State Highway Engineer of North Carolina; W. Ord, Lakewood Engineering Co., Cleveland, Ohio; James H. MacDonald, Consulting Highway Engineer, New Haven, Conn.; J. R. Draney, General Sales Manager, U. S. Asphalt Refining Co., New York, N. Y.; T. J. Wasser, County Engineer of Hudson County, New Jersey; H. K. Bishop, Chief Engineer of Construction, Indiana State Highway Commission; J. E. Pennybacker, Secretary, the Asphalt Association, New York, N. Y.; W. P. Blair, Vice President, National Paving Brick Manufacturers' Association, Cleveland, Ohio; P. Koehring, Secretary and Treasurer, Koehring Machine Co., Milwaukee, Wis.; George Bartlett, Portland Cement Association, Chicago, Ill.; C. D. Snead, Bridge Engineer, Kentucky Department of Public Roads; Richard Hopkins, Troy, N. Y.

On Monday evening the annual dinner of the American Road Builders' Association was held at the Hotel Seelbach Auditorium. There were about 300 in attendance. There were no speeches, their place being taken by a vaudeville entertainment.

GROUP OF DELEGATES AND GUESTS AT THE SEVENTEENTH ANNUAL CONVENTION OF THE AMERICAN ROAD

TUESDAY, FEBRUARY 10.

The first technical session of the convention was held on Tuesday forenoon. That session and the one in the afternoon were devoted to the general topic, "Design and Construction of Different Types of Pavements," the only other matter on the day's program, the report of the committee on the question, "Is State Supervision of the Construction and Maintenance of All Highways Desirable?" being put over until the annual meeting in November on account of the absence of the chairman, A. R. Hirst, State Highway Engineer of Wisconsin.

The morning session was devoted to the consideration of the two sub-topics, "Concrete" and "Brick." H. K. Bishop, Chief Engineer of Construction, Indiana State Highway Commission, presided. The formal paper on concrete pavement construction was presented by A. N. Johnson, Engineer, Portland Cement Association. [Since it is the intention to print the texts of the papers in "Good Roads," they will not be reviewed here.—Ed.] The discussion which followed was participated in by H. E. Breed, formerly Deputy Commissioner of Highways of New York; J. A. Duchastel, City Engineer of Outremont, P. Q.; Chas. M. Upham, Chief Engineer of the Delaware State Highway Department; H. P. Gillette, Editor of "Engineering and Contracting," and others. The discussion was chiefly about the proposal made in the paper to use a layer of fine stone or gravel under the slab; the proportioning of the mix in accordance with a table accompanying the paper; the use of bank-run aggregate and of blast furnace slag; the action of reinforcement in preventing the spread of cracks, especially longitudinal cracks; and methods of preparing the subgrade.

The paper on brick construction was presented by M. B. Greenough, Secretary of the National Paving Brick Manufacturers' Association. It was discussed by Mr. Upham; Mr. Breed; Clark R. Mandigo, and others. It centered on the statement by Mr. Greenough that the use of lug bricks was no longer the most approved practice.

At the afternoon session, at which C. P. Fortney, Chairman of the West Virginia State Roads Commission, presided, papers were presented on bituminous macadam construction by J. E. Pennybacker, Secretary of the Asphalt Association, and surface treated macadam and gravel by P. P. Sharples, Manager of the General Tarvia Department of the Barrett Co. The paper on bituminous concrete construction, scheduled for presentation by Theodore S. Oxholm, Engineer in Charge, Bureau of Engineering, New York City, was postponed until later because of the absence of the author.

The discussion on Mr. Pennybacker's paper was taken part in by James H. MacDonald, former State Highway Commissioner of Connecticut; Mr. Sharples; Mr. Upham; A. H. Hinkle, Chief Engineer of Maintenance, Indiana State Highway Department; and others. In discussing the paper, attention was called by Mr. Sharples to the need for taking this type of pavement into consideration where it was suitable, because it was of low cost and its cost had not increased to so great an extent as the cost of many other types. He also stated that while hard stone was necessary to produce pavements of the greatest wearing qualities, a softer stone could be used to advantage in many places where the traffic was comparatively light. The use of blast furnace slag for the aggregate was also discussed, as was the use of gravel.

The paper on surface treatments, presented by Mr. Sharples, was discussed by Mr. Gillette; H. K. Bishop, Chief Engineer of Construction, Indiana State Highway Department; Julius Adler, of the Atlantic Refining Co., Mr. Upham, and others. Most of the discussion concerned the use of the so-called sheep's foot (or petrolithic) roller.

On Tuesday evening moving pictures of road machinery in operation were shown in the convention hall by a number of the exhibitors.

WEDNESDAY, FEBRUARY 11.

E. J. Mehren, Editor of "Engineering News-Record," who was to have presided at the forenoon session on Wednesday, was unable to be present on account of illness and his place was taken by Chief Engineer Upham of the Delaware State Highway Department.

A. H. Blanchard, Professor of Highway Engineering and Highway Transport at the University of Michigan, who was to have presented a paper on "The Relation of Highway Transport Surveys to the Economic Design of Highways," was ill and his place on the program was taken by A. W. Osborne, Division Manager of the White Co., Cleveland, Ohio, who spoke on the same topic. He was followed by Lieut. Col. J. M. Ritchie, of the Motor Transport Corps, U. S. Army, also on the topic of transport surveys. The subject was discussed by Richard Hopkins, of Troy, N. Y.; J. Frank Smith, General Manager of the Kansas Good Roads Association; C. H. Neal, and others.

BUILDERS ASSOCIATION AT THE JEFFERSON COUNTY ARMORY, LOUISVILLE, KY., FEB. 9-13, 1920

Henry G. Shirley, Secretary of the Highway Industries Association, presented a paper on the subject, "Fundamentals of Early Highway Construction, and Are We Neglecting Them?"

During the session a brief address was made by F. C. Biggs, Minister of Public Works and Highways of the Province of Ontario, Canada.

The session was adjourned promptly at noon to permit the making of a motion picture of the delegates for one of the weekly screen news services.

The first paper of the afternoon session, at which President Coleman of the A. R. B. A. occupied the chair, was "New Highway Tests Being Made by the Bureau of Public Roads," which was presented by A. T. Goldbeck, Engineer of Tests of the Bureau of Public Roads, U. S. Department of Agriculture. The paper was illustrated by a number of lantern slides showing the apparatus used and the manner of conducting the experiments. The discussion that followed was participated in by Chief Engineer Bishop of the Indiana State Highway Department; James H. MacDonald; W. P. Blair, Vice President of the National Paving Brick Manufacturers' Association, and others.

S. L. Squire, President of the Canadian Good Roads Association spoke briefly of road conditions in Canada and of the work being done by his organization.

Business Meeting

The business meeting of the American Road Builders' Association was held at the close of the afternoon session. The principal matters taken up were the report of the Resolutions Committee and the election of the Nominating Committee to select candidates for officers for the next year. The resolutions reported by the Resolutions Committee, as adopted by the meeting, follow.

RESOLUTIONS

BE IT RESOLVED by the American Road Builders' Association, in convention assembled at Louisville, Ky., February, 1920, that it be the sense of this convention that the policy of guaranteeing pavements should be discontinued, and that the responsibility of the pavement should be directly dependent upon the enginering spcifications, and inspction, covering the individual projects.

BE IT RESOLVED by the American Road Builders' Association, in convention assembled at Louisville, Ky., February, 1920, that a committee on Uniform Highway Signs be appointed and instructed to consider not only the standarization of directionary and precautionary signs, but also to consider the advisability of erecting signs that will separately indicate the kind and character of pavement, the year when constructed and other details that will be of service to the general public.

BE IT RESOLVED by the American Road Builders' Association, in convention assembled at Louisville, Ky., February, 1920, that the American Road Builders' Association extend to His Excellency, the Governor of Kentucky; to the state and county officials; to His Honor, the Mayor of Louisville; to the citizens and ladies of Louisville; and to the Convention and Publicity League and Reception Committee, its great appreciation and sincere thanks for the unbounded hospitality extended and entertainment furnished during the convention.

BE IT RESOLVED by the American Road Builders' Association, in convention assembled at Louisville, Ky., February, 1920, that the American Road Builders' Association extend to the papers of Louisville its sincere thanks and high regard for the valuable assistance and aid rendered in making possible one of the greatest and most successful road meetings ever held by this organization. This is especially appreciated at this time when improved highways are of such value and are such an important factor to the country in reducing the high cost of living and stabilizing the country's affairs.

BE IT RESOLVED by the American Road Builders' Association, in convention assembled at Louisville, Ky., February, 1920, that a committee be appointed by the President to confer with other road organizations for the purpose of ascertaining the possibility of holding in the same city the yearly conventions of the respective organizations, and at approximately the same time. This is for the purpose of bringing together a cooperation between all road organizations. This committee to report to the Executive Committe which will have its usual authority to act.

WHEREAS, Many efficient and experienced highway officials are frequently replaced in office, due to the change of administration, and

WHEREAS, It is very detrimental to the administration, construction, and maintenance of our highways, that the experience and knowledge of trese men are so frequently lost, as they are compelled to seek more permanent employment,

THEREFORE, BE IT RESOLVED by the American Road Builders' Association, in convention assembled at Louisville, Ky., February, 1920, that the American Road Builders' Association protest against such action and strongly endorse the continuation in office of all highway officials so long as they render honest and efficient service.

WHEREAS, The appropriations under the Federal Aid Road Act have been made only to include the fiscal-year ending June 30, 1921, and

WHEREAS, There are now pending in Congress the Townsend Bill for a national highway system; various proposed amendments to the Federal Aid Road Act, and other measures looking to a continuance of federal participation in highway improvement; and

WHEREAS, The necessity for an effective and consistent highway policy on the part of our National Government will be more pronounced during the coming years when increased production and ample transportation facilities will be vital to the safety and happiness of our people, and

WHEREAS, The issues involved in a federal highway policy call for the most thorough technical, economic and administrative consideration, and

WHEREAS, The failure to enact legislation by reason of a conflict of measures, would be disastrous;

NOW, THEREFORE, BE IT RESOLVED, by the American Road Builders' Association, in convention assembled at Louisville, Ky., February, 1920, that the Congress of the United States be petitioned to establish, as soon as possible, a commission of competent persons to prepare and submit to the Congress within one year a plan of further participation by the Government in highway improvement, and

BE IT FURTHER RESOLVED, That the President of the Association appoint a committee of five, whose expenses are to be borne by the Association, to lay this resolution before the appropriate committees of Congress and to transmit copies thereafter to interested organizations and individuals, and to take such steps as may be most helpful to Congress in the preparation of an appropriate legislative measure.

C. M. UPHAM, Chairman
H. G. SHIRLEY
C. P. FORTNEY
FRANK PAGE
W. ORD
J. H. MAC DONALD
J. R. DRANEY
T. J. WASSER
H. K. BISHOP
J. E. PENNYBACKER
W. P. BLAIR
P. KOEHRING
GEO. BARTLETT
C. D. SNEAD
RICHARD HOPKINS
Committee.

Of about twelve names proposed for the Nominating Committee, the seven chosen in accordance with the constitution and by-laws were as follows: Jos. R. Draney, General Sales Manager, the U. S. Asphalt Refining Co., New York, N. Y.; R. A. Meeker, Consulting Highway Engineer, Newark, N. J.; W. A. McLean, Deputy Minister of Highways of Ontario, Toronto, Ont.; H. K. Bishop, Chief Engineer of Construction, Indiana State Highway Department; S. Benson, Chairman, Oregon State Highway Commission; Chas. M. Upham, Chief Engineer, Delaware State Highway Department; A. W. Dean, Chief Engineer, Division of Highways, Massachusetts Department of Public Works.

On Wednesday evening a ball for members and guests was given by the American Road Builders' Association at the Seelbach.

THURSDAY, FEBRUARY 12

James H. MacDonald, Treasurer of the A. R. B. A. and formerly State Highway Commissioner of Connecticut, presided at the session on Thursday forenoon.

The first matter taken up was the report of the Committee on "Methods of Strengthening and Reconstructing Highway Bridges for Heavy Motor Truck Traffic." It was presented by the chairman, Willis Whited, Bridge Engineer of the Pennsylvania State Highway Department. He also read several letters received from members of the committee too late for inclusion in the report. Those who spoke in the discussion which followed included Henry G. Shirley, Secretary of the Highway Industries Association; George C. Dielh, County Engineer of Erie County, New York; C. H. Neal, of North Carolina; F. E. Ellis, Manager, Essex Trap Rock & Construction Co., Melrose, Mass., and others. Most of the discussion centered around the question of supervision over bridge work.

The next matter taken up was the paper on "What are the Fundamentals of Modern Highway Construction?" In the absence of the author, W. G. Thompson, State Highway Engineer of New Jersey, the paper was read by Mr. Shirley.

This was followed by a further discussion of the paper, "Fundamentals of Early Highway Construction, and Are We Neglecting Them?" presented by Mr. Shirley on Wednesday. Among those who took part in the discussion were C. H. Neal; J. Frank Smith; James H. MacDonald; G. P. Coleman, and W. P. Blair. Width, with especial reference to its influence on maintenance costs, was the chief point covered in the discussion.

The first matter at the afternoon session on Thursday, at which Henry G. Shirley presided, was the presentation of the paper on "Factors Which Will Limit Highway Construction During the Coming Season—Materials—Increasing the Output of Existing Plants," by Lieut. Col. O. P. Chamberlain, Vice President and General Manager of the Dolese & Shepard Co., of Chicago, Ill. It was followed by a discussion participated in by James H. MacDonald, Richard Hopkins, F. E. Ellis, George C. Diehl and others.

T. H. MacDoald, Chief of the Bureau of Public Roads then presented the paper on "For What Class of Roads and What Type of Construction Should Federal Aid Funds be Used?" This paper was scheduled for the forenoon session, but was postponed until the afternoon on account of Mr. MacDonald's absence. It was followed by a discussion participated in by J. Frank Smith, F. E. Ellis, Willis Whited, H. K. Bishop, G. C. Diehl, and others.

The exhibition was kept open on Thursday evening and moving pictures were again shown in the convention hall by some of the exhibitors.

FRIDAY, FEBRUARY 13

According to an announcement made on the preceding day, the two sessions scheduled for Friday were combined into one. C. M. Upham, Chief Engineer of the Delaware State Highway Department, presided.

The first topic taken up at the session was "Cooperation Between Engineers and Contractors in the Execution of Highway Programs," presented from the contractor's point of view in a paper by R. G. Collins, of Bates & Rogers, Chicago,

(Concluded on page 102)

The Eleventh National Good Roads Show Under the Auspices of the A. R. B. A.

Brief Descriptions of Road Machinery and Material Displays at the Exhibition Held in Conjunction with the Seventeenth Annual Convention of the American Road Builders' Association

The Eleventh National Good Roads Show was held under the auspices of the American Road Builders' Association in the Jefferson County Armory, Louisville, Ky., Feb. 9, 10, 11, 12 and 13, 1920. The hall was attractively laid out with white and golden rails and partitions between the booths and palms and banners lent a festive air to the show. A large number of exhibitors were represented and the attendance was large. Music by a local orchestra was rendered occasionally. The exhibitors at the show were as follows:

The Acme Road Machinery Co., of Frankfort, N. Y., showed their gravel screener for road work and photographs of their entire line of equipment. Chas. W. Cook, Sales and Assistant General Manager, and L. G. Jennings, Manager of the Cincinnati office, were in charge.

The Allis-Chalmers Mfg. Co., of Milwaukee, Wis., had on exhibition a 6-12 general purpose and a 18-30 tractor. Representatives in charge were E. H. Mattingly, L. C. Pounds and G. R. Grenough.

"The American City," of New York, N. Y., displayed copies. Those in attendance were Edgar J. Buttenheim, President, J. T. Dix, Vice President, and Theo. R. Kendall, Engineering Editor.

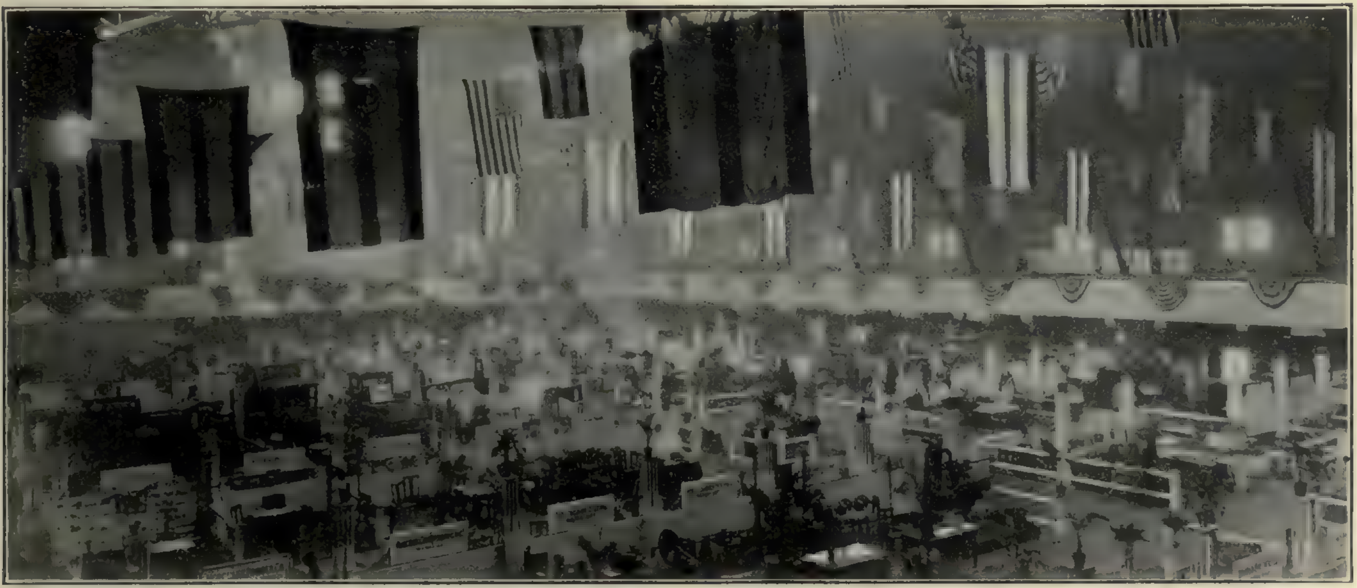
The American Road Plane, Inc., of Chicago, Ill., displayed a road plane. J. W. Lee was in charge of the exhibit.

The American Tar Products Co., of Chicago, Ill., showed tar products used in road construction and maintenance, under the direction of the S. F. Troxell Co., Kentucky representatives, and W. E. Crowell, representing the General Sales Department.

The Armco Iron and Flume Manufacturers Association, of Chicago, Ill., exhibited Armco American ingot iron culverts. G. E. Hammet, D. C. Herron and L. R. Ives were in attendance.

The Asphalt Association of New York, N. Y., showed models of various types of asphalt construction, foundations and drainage structures. Samples of asphalt and charts showing statistics of use of this material in the larger cities were shown and technical brochures on asphalt were distributed. The men in attendance were J. E. Pennybacker, Secretary; W. E. Rosengarten, Traffic Engineer; Prevost Hubbard, Chemical Engineer and J. B. Hittell, Chicago District Engineer.

The Atlas Car & Mfg. Co., of Cleveland, O., showed dump and material cars and track and switches. S. A. Williams, Jr., represented the company.



GENERAL VIEW OF THE ELEVENTH NATIONAL GOOD ROADS SHOW OF THE A. R. B. A.

The Baldwin Locomotive Works, of Philadelphia, Pa., distributed literature on industrial steam, gasoline and kerosene locomotives. Leo J. Murray was in charge of the exhibit.

The Barber Asphalt Paving Co., of Philadelphia, Pa., showed asphalt materials, paving machinery and a new vertical type boiler macadam roller. Those in charge of the exhibit were J. E. Morris, Manager of the Street and Road Department; G. R. March, Sales Manager, Iroquois Machinery Department and Fred F. Massey, J. Harvey Giles, R. G. McKay and H. M. Stafford, District Managers.

The Barber-Greene Co., of Aurora, Ill., exhibited a wagon loader and conveyor under the direction of A. C. MacDonald.

The Barrett Co., of New York, N. Y., had a comprehensive display of Tarvia X, B, A, KP, and XC, and also pitch and mastic filler. Those in charge were P. K. Scheidler, J. S. Crandell and D. C. Mittelsdorf.

T. L. Barrett, of Louisville, Ky., local agent for the Good Roads Machinery Co., and the Pioneer Asphalt Co., represented those firms, whose exhibits are described in other paragraphs.

The Beach Mfg. Co., of Charlotte, Mich., showed a sand screen, tamper roller, cast iron culvert, corrugated culvert, road drags and wheel and blade scrapers. J. W. Sanders was in charge of the exhibit.

Beard & Co., of Louisville, Ky., exhibited the Jennings automatic dump body, for which they are distributors. E. G. Beard and M. Galvin were in charge of the exhibit.

"Better Roads and Streets," of Dayton, O., a publication had a booth at the exhibition and distributed copies.

The Bitoslag Paving Co., of New York, N. Y., displayed samples and distributed literature. Those at the exhibit were J. R. Draney, General Sales Manager; H. L. Brahm and A. J. Brahm, licensees for Kentucky and Ohio; J. R. Valk, Western Sales Manager; and J. C. Rock, General Representative.

The Blaw-Knox Co., of Pittsburgh, Pa., exhibited curb and sidewalk forms, clamshell buckets and collapsible and adjustable culvert forms. Ed. M. Ornitz, Manager of the Road Department; J. C. McQuide, Sales Engineer, and the Brandeis Machinery Co., of Louisville, were in charge of the exhibit.

Ben J. Brumleve, of Louisville, Ky., exhibited Mack trucks. Those in charge of the exhibit were Ben J. Brumleve and W. O. Clifford.

The Bucyrus Co., of South Milwaukee, Wis., displayed a line of steam shovels, under the direction of H. R. Hance and H. M. Swigart.

The Burch Plow Works Co., of Crestline, O., showed a stone unloader and stone spreader. Those in attendance were B. H. Ferguson and Edw. C. Bishop.

The Burton Engineering & Machinery Co., of Cincinnati, O., exhibited a gasoline locomotive for road building purposes. G. A. Cadwell, Sales Manager, was in charge of the exhibit.

The John F. Byers Machinery Co., of Ravenna, O., exhibited photographs and distributed literature, under the direction of L. A. Babcock.

The Carbic Mfg. Co., of Duluth, Minn., exhibited Carbic flare lights, under the direction of the Roy C. Whayne Co., of Louisville, Ky., referred to in a later paragraph.

The Philip Carey Co., of Lockland, Cincinnati, O., showed the Carey elastite expansion joint, elastite rail filler, elastite pipe joint compound, elastite expansion joint installing devices and models and literature showing the application of these products. The representatives of the company were F. C. Smith, Consulting Engineer; H. C. Innes, Consulting Engineer; H. R. Koester, Manager, Elastite Department; H. A. Buckley, District Manager, Philadelphia; and H. C. Foster, Contracting Engineer.

The J. I. Case Threshing Machine Co., Inc., of Racine, Wis., showed a rock crusher, with 16-ft. elevator, a 22-40 hp. and a 15-27 hp. kerosene tractor. C. M. Green, Branch Manager, was in charge.

Chalmers & Williams, of Chicago Heights, Ill., exhibited rock crushing machinery and distributed literature. T. K. Easton, Sales Engineer, was in charge of the exhibit.

The Clark Tructractor Co., of Chicago, Ill., showed a new gasoline truck for hauling aggregate to mixer or concrete from mixer. Those in charge of the exhibit were L. J. Schneider, Sales Manager; W. B. Eldred, of the Sales Department; R. J. Burrows, Vice President; and E. W. Clark, Advertising Manager.

The Clay Products Association, of Chicago, Ill., displayed vitrified salt-glazed clay pipe for road culverts, under the direction of Benjamin Brooks.

The C. H. & E. Mfg. Co., of Milwaukee, Wis., exhibited power pumps and engines. (See "Koehring Machine Co.")

The Cleveland Tractor Co., of Cleveland, O., displayed a Cleveland tractor. H. H. Kramm, T. F. Utley and F. D. Manning were in charge of the exhibit.

The Columbian Steel Tank Co., of Kansas City, Mo., had on exhibition a Columbian hoist and steel dump body for motor trucks. G. F. Price was in charge.

The Commercial Auto Body Co., of Louisville, Ky., showed a Bruder easy-dump hoist with contractor's body, under the direction of C. E. Stamps.

The Concrete Publishing Co., of Detroit, Mich., publishers of "Concrete," distributed copies. The representatives in attendance were P. S. Johnson, Advertising Manager, and George F. Crotty, Subscription Manager.

Connery & Company, Inc., of Philadelphia, Pa., showed a tar and asphalt heating kettle equipped with oil burner and a combination tar and asphalt heater and sand drier for patching. Albert D. Stewart, Sales Manager, was in charge of the exhibit.

The County Engineer's Office, of Jefferson County, Ky., exhibited a large road map of Kentucky, with the County Engineer's office force in charge. This booth was also the headquarters for the Louisville Club, American Association of Engineers.

The Cressy Contracting Co., of Everett, Mass., showed photographs of oil, tar and asphalt sprayers. Miss E. H. Cressy and R. Pebworth were in charge of the exhibit.

The F. D. Cummer & Son Co., of Cleveland, O., distributed catalogs and literature on Cummer asphalt plants, under the direction of I. Freeman.

The Domestic Engine & Pump Co., of Shippensburg. Pa., displayed road builders' gasoline pump units. W. E. Barbour and P. M. Kidd were in charge.

The Dunn Wire-Cut Lug Brick Co., of Conneaut, O., showed samples of wire-cut lug brick and distributed literature. Those in charge were F. B. Dunn, President; B. E. Kinner, Secretary; and James C. Travilla, Consulting Engineer. Carnations were distributed to visitors at the exhibit.

The Easton Car & Construction Co., of Easton, Pa., showed a unique photographic display of Easton equipment for concrete road construction. A. R. Amos, Jr., was in charge.

The Elgin Sales Corporation, of New York, N. Y., showed its line of Elgin motor-driven street cleaning machinery, under the direction of George C. Dodge and A. M. Anderson.

The Emulsified Asphalt Co., of Indianapolis, Ind., showed samples of emulsified asphaltic concrete and "Emascrete." H. C. Poyntz and E. J. Hunt were in charge of the exhibit.

"Engineering and Contracting," of Chicago, Ill., distributed copies. The representatives were Halbert P. Gillette, President and Editor; Louis S. Loner, Vice President and General Manager; Richard E. Brown, Eastern Manager, and R. W. Hume, Western Manager.

"Engineering News-Record," of New York, N. Y., distributed copies. The representatives were Wm. Buxman, Harry Anness, F. A. Husson, J. P. Neuman and Chas. S. Hill.

The George C. Fetter Co., of Louisville, Ky., local agents for the Keuffel & Esser Co., displayed that company's line which is described in another paragraph.

The Foote Co., of Nunda, N. Y., showed the "Multi-Foote" road paver, under the direction of the Roy C. Whayne Supply Co., of Louisville, Ky., the local agents.

The Galion Iron Works & Mfg. Co, of Galion. O, showed cast iron and corrugated culvert pipe and photographs of their graders, stone unloaders, gravel screening plants and scarifiers. Those in charge of the exhibit were J. M. Patterson, Sales Manager, and T. O. Blanchard, Local Representative.

The General Motors Truck Co., of Pontiac, Mich., showed two G. M. C. road building trucks with dump bodies of 2 and 5-ton capacities. Those at the exhibit were R. A. Sweet, Manager, Indianapolis factory; B. W. Buyes, Local Representative; J. E. Baird, Advertising Manager; Sid Schultze, Local Distributor; and R. G. Clark, Local Salesman.

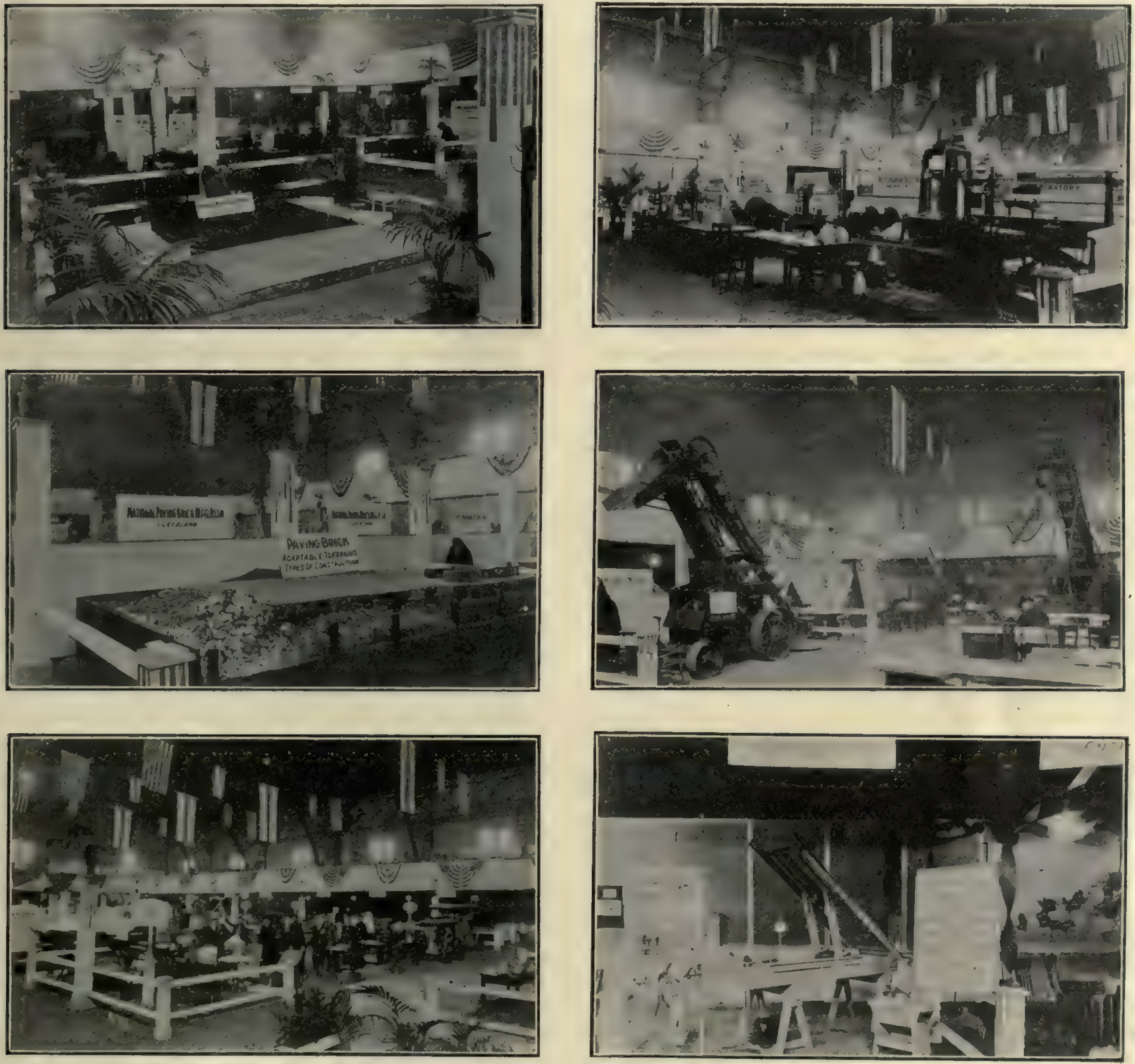
The W. S. Godwin Co., of Baltimore, Md., exhibited its line of steel paving guards, under the direction of W. S. Godwin and R. M. Cooksey.

"Good Roads," of New York, N. Y., distributed copies. The representatives were E. L. Powers, Editor; T. A. Hulbert, Managing Editor; A. J. Watson, Advertising Manager; C. R. Powers, and C. A. Lewis.

The Goods Roads Machinery Co, of Philadelphia, Pa., exhibited a new model of road grader called the "Baby Winner." T. L. Barret, Local Agent, and H. E. Stembridge were in charge.

The Granite Paving Block Manufacturers' Association, of Boston, Mass., displayed granite blocks, granite curbing and Durax block. Those in charge of the exhibit were J. E. Ramsay, Southern Manager; C. D. Pollock, Consulting Engineer; and James J. Tobin, Field Engineer.

W. & L. E. Gurley, of Troy, N. Y., exhibited engineering and hydraulic instruments, under the direction of C. H. Smart and H. M. Dibert.


NATIONAL PAVING BRICK MFGRS ASSN
PAVING BRICK
ADAPTABLE TO VARIOUS TYPES OF CONSTRUCTION

GROUPS OF EXHIBITS AT THE ELEVENTH NATIONAL GOOD ROADS SHOW

The Hauck Mfg. Co., of Brooklyn, N. Y., exhibited asphalt heaters, asphalt smoothing irons, melting furnaces, torch for frozen sand and gravel piles, a burner for fire wagons, kettle melting pots, fire wagons and concrete heaters. C. V. Shipley, Assistant Manager of the Cincinnati service station, and George T. Shanley were in charge of the exhibit.

The Headley Good Roads Co., of Philadelphia, Pa., showed samples of Headley No. 1 Cold Patch and distributed literature. Those in attendance were W. T. Headley, President, T. B. Headley, H. C. Poyntz and E. J. Hunt.

The Heil Co., of Milwaukee, Wis., displayed a steel dump body and hoist mounted on a truck, and welded steel tank. Howard A. Winton, Assistant Manager, and Geo. W. Kuhlman, of the Sales Department, were in charge.

The Heltzel Steel Form and Iron Co., of Warren, O., showed steel forms for concrete road work, under the direction of the Roy C. Whayne Co., of Louisville, Ky., the local agents.

The Hercules Gas Engine Co., of Evansville, Ind., exhibited stationary gas engines, under the direction of Fred C. Fischer.

The Hercules Powder Co., of Wilmington, Del., exhibited photographs and distributed literature. The representatives were J. A. Warren and E. G. Brownfield.

Hetherington & Berner, of Indianapolis, Ind., displayed a model of a 2,000-yd. railway asphalt plant, under the direction of C. L. Addleman.

The Holt Mfg. Co., of Peoria, Ill., exhibited caterpillar tractors. Those in charge of the exhibit were H. W. Chown, Assistant Sales Manager; E. W. Cunningham, C. A. Ralston and F. C. Holmgren, of the Sales Department, and E. B. Mason, of the Service Department.

The Horizontal Hydraulic Hoist Co., of Milwaukee, Wis., exhibited hydraulic hoists for motor trucks. Edw. R. Bacon, President, and G. H. Marshall, General Sales Manager, represented the company.

The International Motor Truck Co., of New York, N. Y., exhibited Mack trucks, under the direction of Ben J. Brumleve, of Louisville, Ky., local agent.

The International Trade Press, Inc., of Chicago, Ill., publishers of "Highway Engineer and Contractor" and "The Roadmaker, Excavator and Grader," distributed copies. The representatives were H. W. Walker and W. R. Harris.

The Jeffrey Mfg. Co., of Columbus, O., exhibited the Jeffrey radial loader for road building work, under the direction of C. R. Heller and R. P. Jackson.

The Kelly-Springfield Motor Truck Sales Co., of Louisville, Ky., exhibited a 3½-ton Kelly-Springfield motor truck. Those in attendance were Clifford E. Bill, Local Agent; and F. W. Bailey and M. F. Pierce, Factory Representatives.

The Kentucky-Indiana Automotive Co., of Louisville, Ky.. exhibited a 3½-ton Indiana truck with dump body. The representative in charge was H. A. Collins.

The Kentucky Rock Asphalt Co., of Louisville, Ky., had on exhibition a road model, and natural rock asphalt in several forms. The representatives in charge were S. O. LeSueur, T. E. Brady and H. L. Busch.

The Kentucky Wagon Mfg. Co., of Louisville, Ky., exhibited an "Old Hickory" bottom dump wagon, with S. E. Grafton in charge.

The Keuffel & Esser Co., of Hoboken, N. J., displayed surveying, mathematical and drawing instruments and measuring tapes and chains. The exhibit was in charge of A. C. Greene and Jesse E. Smith, of the Geo. G. Fetter Co., local selling agents.

The Kinney Mfg. Co., of Boston, Mass., displayed photographs of Kinney auto heaters and distributors, asphalt pumps and heaters and sprayers for repair work. Representatives at the exhibit were A. J. Munday, Manager, Chicago district, and Wm. E. Worcester, Manager, Philadelphia district.

The Koehring Machine Co., of Milwaukee, Wis., exhibited their 14-E paver and a mixer loader. Motion pictures were also exhibited, showing other models of mixers and pavers in operation. Included in the exhibit were also C. H. & E. power pumps and engines. The exhibit was in charge of George Dimond and Mr. Anderson of the Service Department, and Mr. Lichtenburg, Chief Engineer.

The Koppel Industrial Car and Equipment Co., of Koppel, Pa., showed motion pictures of hauling equipment with Koppel track, cars and locomotives in use. H. D. Mercer and F. W. Good were in charge of the exhibit.

The Lakewood Engineering Co., of Cleveland, O., had an extensive exhibit of Lakewood machinery for road building, among which were a subgrader, finishing machine for concrete roads, cars and tracks for narrow guage hauling, clamshell bucket, pressure pumps, etc. The company also operated a concrete paving mixer in the street adjacent to the Armory. Those in charge were Wm. Ord, Manager, Paving Department; Walter Anderson; M. W. Wheeler; G. B. Bright; John Anderson; H. S. Porter; L. L. Rogers, Road Plant Engineer; and L. K. Mead, Publicity Manager.

The Lee Loader & Body Co., of Chicago, Ill., exhibited a 5-ton trailer with four-wheel, reversible 6-yd. body and a 1-yd. automatic Ford end-up body.

The Lima Locomotive Works, Inc., of New York, N. Y., displayed photographs and distributed literature on its 10-ton Shay geared locomotive for construction work. The representatives of the company were W. C. Carnes and M. K. Tate.

The Luther Mfg. Co., of Milwaukee, Wis., showed tool sharpening and grinding machines, with Thomas James in charge of the exhibit.

"Manufacturers' Record," of Baltimore, Md., distributed copies. The representatives were John Glass, A. C. Boughton, and Wm. H. Stone.

The Monroe Calculating Machine Co., of Orange, N. J., demonstrated the Monroe calculating machine, under the direction of Henry H. Doty.

N. S. Monroe & Sons, of Arthur, Ill., displayed the Jumbo road planer. A. J. Monroe and Geo. Monroe represented the company.

"Municipal and County Engineering" of Chicago, Ill., distributed copies. S. E. Hadden was in charge of the exhibit.

The National Paving Brick Manufacturers' Association, of Cleveland, O., displayed two sections of model brick roads, one showing the brick laid flat on a crushed stone base and filled with asphalt, and the other with the brick laid on edge on a concrete base. Those in charge of the exhibit were Clark R. Mandigo, W. R. Schoonover and Maurice B. Greenough.

The Nelson Concrete Culvert Co., of Pontiac, Ill., showed sectional pre-cast, reinforced concrete culverts. J. C. McConaha and C. V. Decker were in attendance.

The Owensboro Ditcher and Grader Co., of Owensboro, Ky., showed road graders and ditchers, under the direction of Perry Hatt and Dan Hutchins.

The Pioneer Asphalt Co., of Lawrenceville, Ill., displayed samples and distributed literature, under the direction of its local agent, T. L. Barrett.

The Pittsburgh Testing Laboratory, of Pittsburgh, Pa., displayed laboratory apparatus for testing road materials, including a 100,000-lb. universal testing machine, a Deval abrasion macihne, a Dorry hardness machine, ball mill, a Page impact machine and a Page cementation testing machine. The men in charge were H. G. Nutting, W. L. Caldwell, J. H. Conzelman, R. L. Morrisson, E. H. Roberts, R. T. Miller, P. J. Freeman, and John M. Bailey.

The Portland Cement Association, of Chicago, Ill., distributed literature upon the use of Portland cement for road building, under the direction of Wm. Weaver.

"Public Works," of New York, N. Y., distributed copies. S. W. Hume was in charge of the exhibit.

Chris. D. Schramm & Sons., Inc., of Philadelphia, Pa., exhibited the Schramm No. 2 portable rock drilling outfit. S. J. Mooney and H. W. Hober were in charge of the exhibit.

The Service Motor Truck Co., of Wabash, Ind., showed a 5-ton dump truck. J. Weber's Sons, local representatives, were in charge of the exhibit.

The Standard Oil Company of Indiana, Chicago, Ill., displayed a line of asphalt and road oils, under the direction of F. P. Allen, W. H. Myers and H. B. Carpenter.

The Texas Company, of New York, N. Y., showed samples of Texaco asphalt and road oil and distributed literature on their use. Charles E. Murphy was in charge of the exhibit.

(Concluded on page 102)

What are the Fundamentals of Modern Highway Construction?*

By W. G. THOMPSON

State Highway Engineer of New Jersey

Since we are all working along more or less similar lines, it is difficult to write or speak upon the above subject without reiterating many statements made before by other men. We are all quite generally agreed upon the fact that the best obtainable will be none too good for the traffic demands of tomorrow.

The following are, in the writer's opinion, the minimum qualifications for main highways built today for the traffic demands of tomorrow.

How are the demands of tomorrow to be met? I say the demands of tomorrow, because the requirements of today are not being satisfied, and a recent report of the National Automobile Chamber of Commerce states there are 7,000,000 automobiles in this country today—approximately ⅞ of all the cars in the world. It is evident that highway authorities must endeavor to visualize the needs of ten years hence and to provide as adequately as funds and facilities will permit for the needs of the next ten-year period, and at the same time provide for the expansion which will inevitably be necessary as the result of the increasing demand for motor vehicles of all types.

What are the fundamental requirements necessary to a realization of the future's needs? The first is vision backed by courage, and funds, expended under the direction of the most capable men the country can produce—men whose tenure of office in public service shall not be subject to the vicissitudes of politics, or the whims of partisan politicians, seeking gratification of personal ambition or greed.

You may say to yourselves, "What has this to do with the subject of 'Fundamentals of Highway Construction?'" I assert it is the most important phase of the entire subject. You desire to build for the future. Some $700,000,000 will be available for highway and street construction during the next three years. In your own business you would not think of entrusting the expenditure of millions to the casual employee, but rather to the tried and capable official, whose conditions of employment you endeavor to make attractive. Existing conditions in public service are not attractive to the really capable men, because they will not long put up with conditions which render them liable to removal for no other reason than the satisfying of a whim. Not for the benefit of any individual, but having a deep interest in the future development of the highways of this country, I desire that you shall individually and as a body, interested in the same object, take the above thought home with you. Think it over and act upon it, for the future welfare of highways will be vitally affected by it.

How are the Needs of the Future to be Determined?

So many different factors enter into consideration of this subject that it is difficult to state and classify them in the order of their relative importance. The first factor is traffic —present and future. For what weight and size of vehicles must the highway of tomorrow be constructed? The future volume of traffic cannot be estimated with any degree of accuracy, since prior to 1912 no really widespread movement for construction of high-class pavements in the rural or interurban districts was noticeable; further that paving of roads in any particular locality increases not only the number of motor vehicles owned in that locality, but the use of its roads by foreign cars, whose owners are ever seeking new routes for business and pleasure. Therefore, we can hardly venture a prediction as to the increase in volume during the next 15 years. It would seem, then, that our design can be influenced only by an arbitrary estimate or determination of future needs, as to the widths of pavements, in order to obviate congestion. The same is true as to thickness or depth of foundation, since there is no precedent to guide design, because no pavement has heretofore been designed to carry a specific loading. Here again enter variables, such as impact at varying speeds and loads and varying sub-foundation conditions.

The Bureau of Public Roads in Washington is now making tests to determine the extent and effect of impact on pavements. These tests, if extensively conducted on each type of modern pavement and covering varying foundation conditions, should prove of great value to the highway engineers of the country.

Lacking specific data and precedent, highway engineers are now making use of the best types known today, such as Portland cement concrete, or asphalt, brick and stone block on concrete foundation, and believe they will last for 15 or 20 years, if proper provision is made for all other factors upon which the pavement must depend for its successful performance and service.

I shall not discuss here the relative values or merits of the several types of pavement in use today, since honest opinions of engineers all over the country differ widely, and such a discussion would be of no value. The choice of pavement will always be a matter of local determination, affected by individual preference and the finances of the body making the selection.

On all main or through highways graded width should be not less than 30 ft; 40 or 50 ft. would be preferable in order that there shall be provided now during the great reconstruction era sufficient width for placing, when future traffic requires, additional pavement to carry four lines of vehicles. The tremendous increase in motor truck traffic points to an early necessity for providing such widths as will enable trucks and slow moving vehicles to travel the outside of the road and leave a lane of sufficient width for two lines of the swiftly moving passenger cars. This will be especially desirable along the Atlantic Seaboard between Philadelphia and Boston.

Where practicable, especially in the open country, no reasonable expense should be spared in securing minimum curvature, particularly where there is likelihood of future obstruction of vision on inside of curves by building operations. Several states are banking curves of 5 deg. or over, the transition being gradual from the straightaway to the curved section, this practice being desirable not only from the riding view point but in that it actually lessens wear on the tires and strain on the car mechanism.

Since the minimum tractive force is required on a level road, it is certainly desirable to spend money now for reduction of grades before expensive drainage systems are installed and pavements laid.

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*Paper presented at the 17th annual convention of the American Road Builders' Association, Louisville, Ky., Feb. 9-13, 1920.

Drainage

Particular attention is being and should be given to sub-foundation drainage, since the integrity of any type of pavement is dependent in marked degree upon this factor. Any expense necessary to secure perfect drainage conditions is justified before pavement is laid, since with good drainage facilities installed during initial construction, pavements may be laid and rebuilt as occasion demands, but it becomes a very expensive proposition to tear up good pavement to correct drainage conditions which should have been provided during the initial construction period. Even in open country, storm sewers should be provided to carry off water where surface grades are to flat for natural flow.

In the "Engineering News-Record," of May 8, 1919, is found this question with respect to the relative requirements of city and country pavements:

"Why are such revolutionary changes necessary in pavements which have given satisfactory service on heavy traffic city streets heretofore?"

The following thought was brought out at a meeting of the National Highway Traffic Association last summer, but I wish to again impress it upon those responsible for highway construction.

It seems to me there are several good reasons for the building of city pavements on interurban and country highways. In the first place, city streets until the past three years were never subjected to the test to which they are now, and will hereafter be, subjected, and it remains to be proven that present city pavements will stand the new strain. We can all remember when no vehicle using New York streets traveled at a speed greater than 4 or 5 mi. per hour. Heavy horse-drawn trucks downtown moved 3 or 4 mi. per hour. Now, motor trucks with the same and heavier loads travel 15 or 20 mi. per hour. On rough pavements the impact and destructive forces are, therefore, many times greater, notwithstanding the change to solid rubber tires. If these things be true in crowded city streets, will they not be more true on country highways, where, when city restrictions as to speed no longer hold, every class of motor vehicle increases its speed to 25 or 30 mi. per hour? I am convinced that if speed alone were to be considered, it would be necessary to build stronger pavements on interurban highways than on city streets. The motor trucking between cities is very heavy today. Tomorrow will but bring a greater volume and density.

The drainage factor also requires that heavier pavement foundation be built on interurban highways. City streets are usually paved from curb to curb. They are underlaid by sewers, pipe lines, conduits, etc., all of which conduce to good sub-foundation drainage, while surface water runs to the gutters and is quickly carried away by the sewers. In the country, and especially in cuts, there are springs, the menace of which it is difficult to remove. Water from open ditches and hillsides seeps into and under the foundation. In wet weather, the foundation is softened. In cold weather, the saturated foundation freezes and expands, heaving the pavement and often breaking the surface. Considering the destructive effect of impact at high speed, and of inadequate drainage, and the relative effect of these two factors on city pavements and country highways, it is believed justification exists for building heavier pavements in the country than in the cities, unless the country drainage system is so perfect and complete as to positively exclude water from the sub-foundation and the sides of the pavement at all times.

Bridges

All highway bridges on main and secondary highways should be designed and built for loadings of not less than 20 tons, it being assumed that 75% of the vehicle load will be on the rear axle. The highways of secondary and tertiary importance of today will be those of primary importance tomorrow; therefore, bridges constructed from this time forth should be constructed with a view to the requirements of tomorrow.

Where bridges of any type span the highways, vertical clearance should be not less than 14 ft. from pavement surface to under side of bridge, and should provide not less than 20, and preferably 40 ft. of clear width in order to provide for the vehicular traffic and possible sidewalk space in the future.

Grade Crossings

Railroad grade crossings should be eliminated by construction of underpass or overhead bridges and by relocation of highways wherever practicable. The death toll due to grade crossing accidents is increasing so rapidly with the increase in number of motor vehicles that early steps should be taken for the elimination of all railroad grade crossings. In one instance of which the writer has knowledge, the relocation of approximately 3 mi. of highway in New Jersey removed forever eight grade crossings from the through highway.

Marking Highways

Too little attention has been given in the past to the matter of properly marking the public highways. The State of New Jersey is now installing on all the routes of the state highway system a comprehensive system of signs and markers to indicate direction, distance, dangerous crossings, sharp curves, and steep grades. These are of substantial construction, having concrete posts, and the inscription so designed and worded as to enable motorists to proceed with the least inconvenience and loss of time. In order to enable motorists to proceed through the least congested districts of the city upon the highway routes, the state is installing and cooperating with the city government to have placed direction markers which enable the motorist to proceed through the city and enter upon the state highway on the other side with the least loss of time and inconvenience.

The above merely sketches what the writer believes are the prime fundamentals of modern highway construction. Possibly some authorities will consider that the width requirements are greater than those really necessary for open country travel, but when Fifth Avenue, New York, Broad Street, Newark, N. J., and Michigan Boulevard in Chicago were laid out, I venture to say the men responsible for the widths of those streets never dreamed they would ever become too narrow. Yet those of you familiar with the streets mentiond will agree that they are too narrow even today. What will be the traffic conditions on these streets ten years hence? It is confidently believed by the speaker that within the life-time of many now present we shall see, between many of our larger cities, two levels of vehicular traffic—one for freight along the present traveled roadways and another for passenger vehicles superimposed upon it in the same manner as the elevated highway, having approaches leading to it at intervals from the lower levels, as has the present Motor Parkway on Long Island.

To summarize: The construction of roads for future motor vehicle traffic requires, as I see it:

First, money.

Second, men with training and experience, capable of looking into the future and with courage designing and demanding construction of the best types which modern science and experience have given us.

Then come the greatest widths obtainable at this time, looking forward to future expansion; the installation of such drainage facilities with the initial construction as will for many years obviate the necessity of tearing up pavements to correct drainage defects.

We should have on all routes elimination of sharp curves, wherever practicable; minimum grades should be secured during initial construction; the construction of wide, strong bridges; such marking of routes from beginning to end and at their intersections with other roads as will leave no doubt in the mind of the motorists as to which way he should follow to reach his destination.

These results are to be attained only by the closest cooperation between all the interests interested in the manufacture of vehicles for highway transportation and the users of such vehicles and the authorities of the country responsible for the building of highways, and by constant preachment and education of the entire population of the country to the need for looking into the future rather than to build for the immediate present.

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New Highway Tests Being Made by the Bureau of Public Roads*

By A. T. GOLDBECK

Testing Engineer, Bureau of Public Roads, U. S. Department of Agriculture

There have been three more or less distinct eras of road construction in this country, marked by the character of traffic the roads have had to carry. Statistics show that in 1899 there were but 3,700 passenger and commercial motor vehicles produced in this country, and up to that time the roads were subjected almost entirely to horse-drawn vehicles. In general, the loads hauled were comparatively light; the traffic was rather slow moving, and the principal destructive effect of this traffic was that of abrasion of the road surface. For carrying such traffic water-bound macadam and gravel roads were highly satisfactory.

After 1899, however, motor vehicles began to multiply in great numbers, with an enormous increase in 1909, when 127,731 motor vehicles were manufactured. In general, these vehicles were comparatively light, were rubber-tired and moved at relatively high speeds, and in consequence an entirely new type of destructive effect was created on the roads. The road surface no longer disintegrated through actual abrasion, but the high speed of the vehicles very effectively removed the fine binding material from the surface, the individual pieces of stone became loosened and the road ravelled. It then became necssary to adopt new types of construction in which the road surface was more securely bonded together.

Very recently, within the past five years, we have seen still a third type of road failure, due to the large increase of comparativley slow moving but very heavy motor trucks. We have seen roads that were considered excellent types for fast moving light motor vehicles pounded to pieces through the action of heavy motor truck traffic, and this kind of traffic is the traffic we must design our roads to withstand in the future. The heavy motor truck came upon us very suddenly and its effect on the roads was brought very forcibly to our attention through the combined action of the exceedingly heavy motor truck hauling during the war and the soft, thawing subgrades following an unusually severe winter. We found that our road surfaces, under the conditions of subgrade as they existed then, and as they are likely to exist in the future, were totally inadequate to support such heavy load concentrations.

In view of these conditions, and in view of the enormous road building program with which we are faced, it has become necessary to gain every possible bit of information on the load supporting properties of different types of road surfaces as quickly as possible. The existing car and labor shortage will force us to build the best we know how with materials available, and this will mean the construction of many different types of roads. Different subgrades, having variable load supporting properties with the drainage methods now used, will require different types of road surfaces to withstand the traffic. Economic conditions will render it advisable to build one type of road in a certain locality rather than another type, but we should know definitely how to design these different types so that they will be comparable in their load carrying capacity.

Given a definite set of conditions, such as character of subgrade, weather conditions, and maximum allowable load on a road, we should be able to say with certainty how to design that road for the given conditions so that it will not fail under the traffic, but at the same time will be built with the greatest economy. The bridge builder, having a given set of conditions in mind, knowing the maximum loads to which his bridge will be subjected, is able to design his bridge in a rational manner so that when it is constructed according to his plans and specifications he knows his bridge has ample safety. Would this not be a desirable status for the science of road building, and would it not be desirable for us to get away from the old empirical methods and put the design of roads on at least as high a basis as that of the design of bridge structures? Such a basis is not beyond the realms of possibility and will probably be accomplished not many years in the future.

With some of the foregoing problems in mind, we have been performing a number of investigations which may be subdivided as follows:

1. A study of the amount of impact delivered by motor trucks to roads.
2. A study of the effect of this impact on different types of road surfaces.
3. A study of the effect of traffic on different types of road surfaces.
4. A study of the bearing value of subgrades as affected by moisture.

1. A Study of the Amount of Impact Delivered by Motor Trucks to Roads

Almost anyone would be willing to grant that our road surfaces capable of carrying ordinary passenger automobiles would not be likely to fail under the mere static weight of our heavily loaded motor trucks, and an investigation tending to confirm this idea was made on the Camp Humphreys concrete road, in which it was shown quite conclusively that static loads produce very low stress in an 8-in. concrete slab—so low in fact that it was quite evident that the mere weight of the truck at rest on the road surface, is in general not enough to produce failure of that surface. Heavy trucks do not merely rest on the surface, however, but move with more or less speed, and the surfacing being not perfectly smooth produces vertical motion in the truck so that the wheels exert more or less of an impact action on the surface.

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*Paper presented at the 17th annual convention of the American Road Builders' Association, Louisville, Ky., Feb. 9-13, 1920.

With the diea of determining just how much this impact force actually is, we started a series of investigations in order to measure it. For these tests we constructed a concrete lined pit in the road surface and in this pit we placed a hyrdraulic jack, to the plunger of which was fastened an enlarged head and the top of which protruded slightly above the surface of the pavement. A number of ½x½-in. copper cylinders were carefully prepared and were given a special heat treatment in order to anneal them and render them very uniform in quality. To determine the amount of impact exerted by a truck, one of these copper cylinders is placed under the plunger of the jack and the rear wheel of the truck is caused to strike this plunger by falling through a known height when the truck is moving at a known speed. The blow delivered by the wheel in falling on the plunger is transmitted to the copper cylinder, shortening it to a measured amount.

In these investigations a large number of tests were made in which the height of fall was varied from ¼ in. up to 3 in., a new copper cylinder being used for each test and each copper cylinder being deformed a different amount, depending upon the force of the blow delivered to it. To measure the blow, copper cylinders, selected at random from the same lot, were compressed in a testing machine, and the loads required to compress them known amounts were obtained. The compression of the copper cylinders under impact was then compared with the compression obtained from known loads applied by the testing machine, and in this way it was possible to determine the force of the blow delivered by the truck in terms of an equivalent static load.

Many things have been discovered with regard to the amount of force delivered to the road surface by traffic. Thus, we now know that under certain extreme conditions the force of the blow may be five or six times as much as that exerted by the truck when it is at rest on the road surface. This condition was obtained, for instance, when an army truck, the upsprung weight of one rear wheel of which was 1,837 lb., and the total weight on one rear wheel was 7,750 lb., fell through a height of 3 in. while traveling at a speed of 15 mi. per hour. The force of the blow produced by this wheel was approximately 42,000 lb., or over five times the force produced by that same wheel at rest on the road. This is an extreme case, and under actual conditions would require an exceedingly rough road for such a blow to be delivered.

It may be interesting to note that the so-called unsprung weight of a truck—that is the weight not supported on the springs—has great influence on the force delivered to the road surface, and a heavy unsprung weight in general produces a heavy blow to the road. A large number of results have been obtained from these investigations, giving us information on the force likely to be exerted on road surfaces by different weights of vehicles; and these tests are being conducted in order to determine the effect of pneumatic tires as compared with solid tires and of special types of tires and wheels designed to provide extra cushioning effect over that of solid tires.

The tests are conducted to give conditions of impact approximating those actually obtained in the road, thus:

(1.) The truck wheel is caused to fall on the weighing device;

(2) The wheel mounts an obstruction placed on the weighing device;

(3) The wheel falls from different heights on a wedge-shaped block placed on the weighing device.

This latter condition would, for instance, approximate that in which a wheel jumps over a hole in the road and lands on the far side, and this is one of the most severe conditions of impact.

A number of detailed investigations were made in order to obtain information in connection with the main investigation. Thus photographs were taken showing the path described by the body and that described by the hub of the truck. In addition, measurements were taken of the deflection of the rear spring at different periods before and after the impact. In this way we are enabled to separate the effect of the unsprung portion from that of the sprung portion of the truck, and we have thus been able to find that the unsprung portion is of great importance in determining the amount of impact delivered to the road. When these investigations are completed we should have rather full information on one very essential step in the design of roads, namely, the force delivered to the road surface.

It is expected that within the coming year the tests already conducted will be supplemented by additional tests, using motor trucks fitted with a special device which will measure the actual force of impact delivered to roads of various kinds. This device depends in principle on the autographic measurement of the path described by the truck wheels in traveling over the road surface. When an accurate record of the path of the wheel is known, it is a simple problem in physics to calculate the force delivered to the road.

2. A Study of the Effect of Impact on Different Types of Road Surfaces

A knowledge of the force delivered to a road surface by traffic of itself is not of very great value unless we can couple this information with the effect of that force on different types of surfaces. We are, therefore, conducting a second series of tests with this idea in view, namely, determing the effect of impact on different kinds of road surfaces. For carrying on this investigation we have constructed a number of slabs 7 ft. square and laid directly on the subgrade. These specimens include concrete slabs of 1:1½:3 mix, 2, 4, 6, 8 and 10 in. in thickness, and several slabs 14 ft. square, 6 in. in thickness. We have a number of different types of brick slabs built with wire-cut lug, repressed and also vertical fiber brick. Some of these are laid with sand-cushion construction, some with monolithic and some with semi-monolithic construction. We have used sand cushion and also bituminous mastic cushion. We have likewise used several different types of filler, including cement grout, bituminous filler and bituminous mastic filler. The concrete base is 4 in. under some of the slabs and 6 in. under some of the others. We have likewise constructed slabs with 3-in. wire-cut lug brick, monolithic construction with 3 and 4-in. concrete bases. We have also constructed a few slabs laid on 6 in. and 12 in. of macadam. We aim to continue these tests, using a large number of different types of construction that may look promising.

The above slabs will be subjected to impact by means of a special machine constructed for that purpose. It is designed to give impact conditions similar to those given by the rear wheel of a heavy truck. In its present form the machine consists of a 2,000-lb. weight shod at the bottom with a 12-in. solid rubber tire and carrying a 6,000-lb. weight supported through the use of a single heavy truck spring. The entire weight of 8,000 lb. may be raised by means of a cam, gear-driven by a gasoline engine, so that repeated impacts may be delivered at one spot on the slab until failure takes place. We have instruments mounted on the machine which autographically show us the deceleration or suddenness with which the weight is brought to rest upon the slab. From these curves it is possible for us to measure

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Factors Which Will Limit Highway Construction During the Coming Season*

Materials: The Development of Local Supplies

By H. S. MATTIMORE

Engineer of Tests, Pennsylvania State Highway Department

We have to acknowledge that there are factors which apparently tend to limit the amount of highway construction during the coming year. These have been discussed more or less, and there may be solutions to some, while others are possibly beyond our control.

The production of materials is one of these problems to be solved, and possibly one of the important ones, judging by the consideration given this subject in highway circles. Now just what is the present situation and how are we to remedy it? In the first place, it has been customary to rely to a great extent for stone, sand and gravel upon commercial plants producing these supplies. It is questionable in my mind if this was always an economic procedure; in fact, in many localities I am convinced that the opposite was true, but the present day question is not one of economy so much as one of necessity. Existing commercial supplies are far over-figured. Producers themselves appreciate this condition and realize that any large increase of production is not possible at present, and may not be for some time in the future. Therefore, if sufficient materials cannot be produced by commercial plants, the only other solution is to have them produced by the contractors themselves.

In the development of local materials there are two stages—first the location and investigation by the state, second the development by the contractor. To succeed in this work one is just as necessary as the other.

For many years highway organizations have carried on systematic testing of materials, but preliminary investigation and sampling of material sources has been done in a sort of haphazard manner. In most instances it has been placed as a secondary consideration; that is, perhaps the survey corps, or some one who happened to be available at the time, was sent to get a sample from a rock ledge or a sand bank. This resulted, as might be expected, in obtaining incomplete data which were not only misleading to the designing engineer, but also to the contractor bidding on the work. Sometimes another method of procedure is followed. I refer here to having the contractor investigate his own materials. The latter can hardly be considered a fair proposition. The contractor cannot afford to invest capital in an investigation without any assurance that he is to get the contract; also the time limit between the advertising and submitting of bids is not always sufficient to ascertain the quality by test.

Material investigations should be considered with the planning and designing of a highway, and, therefore, should be done by the state itself; also from an economic standpoint it is preferable to have one investigation rather than many separate ones by the various bidders. The part of the work carried on by the state—that is, the investigation and sampling of local material sources—is still in a primitive stage in many parts of the United States. It not only lacks organization, but judging from the number of inquiries received by the writer, many departments lack elementary knowledge of how the work should proceed.

In order to secure the full advantage of these investigations, its importance must first be realized. It requires an organization specializing to a large extent on material survey and this should at least be directed by an engineer familiar with materials and construction details.

A geologic map, if such is available, is of inestimable value as a guide in location work. If such is not available, a preliminary survey and investigation by a skilled geologist should be made. I wish to call special attention to the fact that this is preliminary work only. The final location work should be left to a trained highway engineer. The geologist can guide him regarding the positions of various rock strata, and such guidance will save much time and effort. As the next step, when the engineer has familiarized himself with the general situation, a detailed investigation should be made from an engineering standpoint; that is, considering the factors of availability, transportation to the job, situation as to water facilities, plant set-up, uniformity of the rock strata, and any other factor that would affect an estimate.

Now at this point of the discussion I wish to state that all of this work regarding the practical situation of a quarry should not be left entirely to the contractor. If the state wishes to get full advantage of these locations, the deposits located must be examined from a practical standpoint. If this is not done, any information furnished to the contractor regarding local material sources will have little or no advantage. If the contractor is to bid with the idea of using such sources, he must have confidence in the location, and a degree of respect for the practicability of the engineer who investigated and estimated it.

The engineer employed on this work must have had sufficient highway experience to enable him to judge when deposits are practical to work and which are the most economical to use. After these deposits are located the most favorable ones are investigated in some detail so that the extent and quality of the material can be reported upon. Rock ledges are blasted out so that unweathered samples can be obtained and tested. This latter precaution is especially advisable in most limestone and sandstone deposits. If detached stones in fields or fences are available and considered the most economical for use, a fairly accurate estimate of their extent and location is taken so that hauls can be computed. The most difficult proposition in investigating field-stone is the securing of a representative sample for test and estimating percentages of the different qualities available.

The investigation of sand and gravel deposits is a difficult problem. Few, if any, sand and gravel deposits run uniform, and it often taxes the resources of the investigator to decide how practical it is to work the various deposits encountered Some skill and experience are necessary to secure an approximately representative sample. Occasionally many test pits are required to determine the amount of material available.

The amount of time and expense necessary for investigation of individual projects is likely to vary with each project. If the situation is such that materials from commercial sources would be costly, due to long hauls, etc., a greater expenditure of time and expense is justified in seeking for

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*Paper presented at the 17th annual convention of the American Road Builders' Association, Louisville, Ky., Feb. 9-13, 1920.

Design Construction of Different Types of Pavement*

Surface Treated Macadam and Gravel

By PHILIP P. SHARPLES
Manager, General Tarvia Department, The Barrett Company

The advancing costs of paving have made questions of salvaging existing road structures of great importance. Paving costs have doubled for the cheaper types of road surfacing; but for the more expensive types the costs have trebled. On top of this, interest rates are advancing so that, looked at from an economic point of view, the road engineer is justified in expending very considerable sums per annum to salvage old pavements.

Forty thousand dollars per mile for a new pavement 18 ft. wide is a conservative estimate for a pavement that formerly cost $15,000. Interest on this at 5% is $2,000 per year; depreciation for a life of 20 years, $2,000 per year. The maintenance on top of this would make the total $4,500 per year per mile, that could profitably be spent on an old pavement provided it could be made to carry the traffic to the satisfaction of the traveling public.

Surface treatments with bituminous materials form a ready means for salvaging many types of pavement. Although only the treatment of macadam and gravel will be gone into in detail, it must not be forgotten that methods have been worked out for satisfactorily surface treating bituminous concrete, bituminous macadam, wood block, Portland cement concrete and even, under certain conditions, sheet asphalt and brick paving.

The knell of the macadam road has been sounded, say some of the advocates of high priced pavements, but the conservative engineer will still find in his scheme of paving a place for plain macadam. But he will be careful to so draw his specifications that surface treatments of bituminous materials may be applied effectively to the macadam. Macadam well built on good foundations, when protected with surface treatments, can still be relied upon to carry goodly numbers of vehicles.

Much of the dissatisfaction with surface treatments on macadam roads has arisen not through any fault of the system, but on account of the attempt to salvage pavements that have gone so far that they could not be retrieved by so simple a method, or where they were subjected to traffic that called for a heavier duty type of pavement. It was the engineer's judgment that was at fault, not the method. It would be just as logical to condemn a dwelling house floor because it gave way when the dwelling was used for the storage of pig metal.

The choice of the bitumen too has often been at fault. Dust laying oils and raw tars have been confused with the more permanent refined tars and asphalts which alone will be considered here. Dust layers simply weight the dust particles and prevent their blowing about. The heavier bitumens prevent dust by binding and protecting the road surface, either by penetration into the road crust or by forming protective mats of bitumen and stone upon the surface.

Many of the old macadam pavements have worn thin or have ground up internally under traffic weights that they were not designed to carry. Obviously in theory, but seldom in practice, these old road crusts should be strengthened and drainage errors corrected before successful surface treatments can be expected. With soft rocks it may even be necessary to strengthen the crust by employing some of the modified penetration methods, using the thinner tar or cut-back asphalts applied cold as practiced in Maryland and Wisconsin.

Where new macadam is built, it should be so constructed that surface treatments can be successfully applied soon after or even before the road is opened to traffic. The old tenets of good macadam construction are too well understood to be dwelt upon here. Suffice it to say that drainage and foundations should be good, that the design should be equal to the loads that are to be imposed, that the road should be built of good materials, properly rolled and properly filled and bonded.

The surface must be given particular study. It must be remembered that the final surface produced is a bituminous surface. The contour should be, therefore, not that of a macadam road but that of a bituminous road. A camber of ¼ to ⅜ in. is plenty. A greater crown than this means a slippery road.

The material for the surface course should be carefully chosen. The stone should be as large as can be made to bond in place. For a soft stone sizes grading from 3 in. down to 1½ in. are not too large. With trap rocks and hard stone, ¾ to 2 in. may not be too small, if the pieces of different sizes are well graded.

The kind and amount of bonding material are of great importance. Usually stone chips and stone dust of the same material as the stone used give the best results, but with soft limestones a graded clean gravel from ¾ in. down to ⅛ in. often gives superior results if intelligently used. The aim should be to thoroughly fill the voids in the stone by flushing in the filler with alternate watering and rolling until the surface is solid.

Extreme care should be observed to leave no layer or cake of screenings on top of the stone composing the surface. If any such layer remains it is often impossible to surface treat the road successfully.

Clay and materials that produce slime should be religiously avoided in the top course, as they form emulsions with bitumens and the coating sloughs off.

The aging of the macadam before it receives the bituminous treatment has of late years been the subject of much study. With the heavy mat coats, it is important that the macadam be thoroughly set up by aging before the application is made. The cementing value of the rocks used, the traffic and moisture conditions, are factors in the setting up process. Usually, six weeks to two months in the spring and summer are sufficient. Pavements finished in the fall may be carried through the winter by using calcium chloride, and then the bituminous treatment given as early as practicable in the spring.

If cut-back bitumens, applied cold, are used, it has been found possible to greatly shorten the aging before the application, and even, if care is used, to apply the bitumens on completion of the road. With soft rocks and rocks of low cementing value, new possibilities are indicated by these methods of early protection against automobile traffic.

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*Paper presented at the 17th annual convention of the American Road Builders' Association, Louisville, Ky., Feb. 9-13, 1920.

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

Founded January, 1892

E. L. POWERS
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T. A. HULBERT
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THE LOUISVILLE CONVENTION

Perhaps the most noteworthy feature of the seventeenth annual convention of the American Road Builders' Association, held at Louisville, Ky., last week, was the general tenor of the discussions at the technical sessions.

An unusually large proportion of those at the convention attended the meetings. The discussions on the papers presented and the topics introduced were frequently not so long as they sometimes are at such meetings, but on the other hand, they were both interesting and to the point. And the subjects in which the greatest interest was evinced differed materially from those usually attracting the most attention.

As a rule, the chief interest centers upon technical questions of construction and maintenance. At Louisville these were subordinated to the broader problems of administration and finance, to the consideration of ways and means of overcoming the labor shortage and transportation difficulties, and to discussions of the relations between contractors and engineers.

While this was undoubtedly due in large measure to the especially important place these matters occupy this year, we believe that it is also partly attributable to the general broadening of the engineer's point of view. He is no longer content to be a mere technician and to do no more than carry out the plans of others. He is taking a keener and more intelligent interest in the problems of administering and financing highway work, in the science and art of government and in the human side of his work.

In the number and variety of exhibits at the show and in the attendance at the convention, the Association made a very creditable showing, in spite of a number of serious handicaps. The attendance was below the number that the officials of the Association had every reason to expect, but the show compared very favorably with the most successful of those held in previous years.

The smaller attendance was doubtless due, in large measure, to the unprecedented activity in the highway field. Many officials and engineers are busy on plans for the great volume of work scheduled for the coming season and many contractors are busily preparing for the work ahead of them. The prevalence of influenza probably prevented many from coming and the transportation difficulties caused by the weather were also responsible for many absences and many delayed arrivals. Another factor in keeping down the attendance was the uncertainty of getting hotel accommodations, which undoubtedly deterred many from starting for the convention.

The only thing that marred the show was the inability of some of the exhibitors to get their larger machines through the Armory doors. This kept out a number of displays that otherwise would have been made. In arrangement of exhibits, decorations and general appearance, the show equalled any ever held under the Association's auspices—if, indeed, it did not excel any other.

CONVENTION PROGRAMS

It is always easy to criticise other people's work, but such criticism frequently is valuable, especially if it is constructive. For that reason it is believed not out of place at this time to call attention to some particulars in which it would be possible to improve upon the average convention program.

If we understand its purpose, the program of a convention or any similar meeting is designed to give attendants and prospective attendants information as to what subjects are to be considered and, especially, when their consideration will be taken up. Very often a given individual is interested in only a certain part or certain parts of the program and wishes to attend the meetings at which that subject or those subjects will be considered. He may even time his arrival at the convention city and plan his departure from it with that end in view.

Under these circumstances, the prime requisite of a program should be accuracy and the first effort of those in charge of its presentation should be to see that the announced schedule is followed. But how often is this done? As a rule, the absence of one or two speakers disrupts the program for an entire day and perhaps affects that of the day following as well. Also, an unduly protracted discussion on some one topic will crowd other equally important matters off the program or leave too little time for their consideration.

These matters can easily be adjusted by assigning definite hours to the various topics scheduled and then insisting on an exact following of the program except as absences of speakers make it impossible. And even these unavoidable absences need affect only the one topic, for the others can still be taken up at the scheduled hours. Ample provisions for papers and discussions omitted during the proceedings can be made by reserving a part of each session for "unfinished business," and using that time to finish discussions that had to be left in order to take up the next subject or for the presentation of papers that had to be omitted because of the authors' absence or for other good reasons.

This is a matter that might well be considered by the American Road Builders' Association in the preparation of its future programs, for, although less at fault in this respect than most other organizations, its proceedings sometimes fall short of reaching their maximum usefulness, because of the failure to closely follow the set program.

The Seventeenth Annual Convention of the American Road Builders' Association

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Ill., speaking as a member of the Associated General Contractors. Mr. Collins was temporarily absent and his paper was read by Mr. Copeland, of the same company. The paper was discussed by F. E. Ellis, Mr. Collins, Mr. Copeland and J. C. Rock, of the U. S. Asphalt Refining Co.

The same topic, from the point of view of the engineer, was presented in a paper by Mr. Upham and was discussed by C. M. Pinckney, Chief Engineer, Department of Public Works, Borough of Manhattan, New York City; Maj. H. F. Porter, Officer of Construction and Repair, Camp Zachary Taylor; H. G. Shirley; Willis Whited; Wm. A. Hansel, Jr., Superintendent of Public Works of Atlanta, Ga.; and others.

The next paper presented was "Maintenance of Completed Roads, the Keystone of Successful Road Development," by Peter Lee Atherton, of Louisville. The discussion following the presentation of the paper was participated in by J. Frank Smith; George C. Diehl and others.

The topic, "Modern Plant and Equipment for Highway Construction," was presented by C. S. Gale, Engineer, Delaware State Highway Department, and James Bannon, Contractor of Joliet, Ill.

The Road Committee of the Kentucky Legislature attended the Friday session and a luncheon afterwards at the Seelbach.

After a very brief discussion of the matter of plant and equipment, Mr. Upham spoke briefly, outlining the plans of the American Road Builders' Association for the future, and then adjourned the convention.

The Eleventh National Good Roads Show Under the Auspices of the A. R. B. A.

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The Thew Automotive Shovel Co., of Lorain, O., showed photographs of methods of handling road building materials. The representatives were D. D. Deeds, Sales Manager; H. A. McLaughlin, Eastern Manager; A. J. Bright, Western Manager; and H. A. Hutchins, Southern Manager.

The Turbine Sewer Machine Co., of Milwaukee, Wis., exhibited a turbine sewer cleaner, under the direction of Philip A. Fuchs, President, and F. H. Fuchs, Manager.

The United States Motor Truck Co., of Cincinnati, O., showed a motor truck with pneumatic tires and four-way body. Those in charge were E. B. Sayers, Local Distributor, and D. B. Ford, Factory Representative.

The Warren Brothers Company, of Boston, Mass., had an extensive display of Warrenite-Bitulithic pavement, showing the material laid over old macadam with crushed stone used in mineral aggregate and also showing Warrenite-Bitulithic with gravel and limestone aggregate. Charts were shown showing the amounts of this kind of pavement laid throughout the county and literature and pocket samples of Warrenite-Bitulithic pavement were distributed. Representatives at the exhibit were E. W. Pimm, Manager, Publicity Department; G. M. Ingram, Vice President, Nashville; E. M. Robinson and R. M. Hyams, Representatives at Nashville, Tenn.

The Roy C. Whayne Supply Co., of Louisville, Ky., exhibited Mono engines and pumps, Boss concrete mixers, scoop conveyors, Carbic flare light and Meyer's pumps. Roy C. Whayne and B. C. Hix were in charge of the exhibit.

Jacob Weber's Sons, of Louisville, Ky., local representatives of the Service Motor Truck Co., of Wabash, Ind., exhibited a 5-ton Service dump truck.

The White Company, of Cleveland, O., showed a 5-ton dump truck with double reduction gear drive. The representatives were A. W. Osborn, Division Manager, Cleveland; H. S. Jenkins; K. Lydecker; B. F. Dunham; C. B. King; and Messrs. Gardner, Humbert and Frasier, Local Representatives.

The Wiard Plow Co., of Batavia, N. Y., showed contractors' road and rooter plows, and a No. 69 combination furrow and rooter plow. John W. Pratt, Vice President and Secretary, and S. J. Hunt, General Sales Manager, were in attendance.

The W. W. Williams Co., of Louisville, Ky., exhibited a 3½-ton Sterling truck with dump body, with Chas. F. Fitch, District Manager, in charge of the exhibit.

The Willite Road Construction Co. of America, of New York, N. Y., displayed samples and photographs of Willite from various parts of the country. Those in attendance were Mrs. H. W. Wilson, General Manager; John G. Tait, Secretary, Ohio Willite Co.; and Guy A. Reeves, Vice President and Manager, Indiana Willite Co.

The Wood Hydraulic Hoist and Body Co., of Detroit, Mich., showed a dump body and hoist for construction trucks, under the direction of R. F. Crego.

The Wyoming Shovel Works, of Wyoming, Pa, exhibited a line of shovels, under the representation of the Lakewood Engineering Co.

New Highway Tests Being Made by the Bureau of Public Roads

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the exact force of the impact. We likewise have instruments to enable us to measure very carefully the deformation of the slab under the repeated blows of this machine.

As the condition of the subgrade will undoubtedly affect the load supporting value of the surfacing, we have constructed duplicate sets of specimens, one set of which is laid on a subgrade which will be purposely kept in a moist condition and, therefore, be of low bearing value, and the other is laid on a subgrade which we will endeavor to keep dry and thus obtain a high bearing value. From the results of these tests we should be able to say just what types of roads may be considered as comparable so far as their resistance to pounding of heavy trucks is concerned.

3. A Study of the Effect of Traffic on Different Types of Road Surfaces

We are conducting still a third series of tests which were designed primarily to enable us to develop suitable laboratory tests for stone paving block, but which we are using incidentally to give us some idea of the relative wearing qualities of different types of surfacings when they are all subjected to exactly the same traffic.

We have constructed a straight track, 400 ft. in length and 2 ft. in width, in which are laid 49 different sections of pavements. As at present constructed, these sections include concrete having different kinds of coarse aggregates including trap rock, gneiss, gravel, soft sandstone, limestone and air-cooled blast furnace slag. There are a number of different kinds of brick pavements in which brick having different percentages of wear are used, the percentages being 16, 19 and 24% in the rattler test. There are likewise sections in which 3-in. brick are used. Both sand cushion and semi-monolithic construction have been employed. The type of filler has also been varied to include cement grout and bituminous fillers. There are also a number of stone block sections constructed of blocks from different parts of the country. The filler has likewise been made to include bituminous as well as Portland cement fillers.

Over these sections a wear machine is hauled by means of a cable-way. This machine consists essentially of five large cast iron wheels, each weighing 1,000 lb. with a tire width of 2 in. Each of these wheels is perfectly free and independent of the remaining wheels and its full weight is exerted on the road surface. They are so arranged that they travel over a strip 12 in. in width and there is considerable impact action exerted by the heavy unsprung weight of these wheels, and the action of this device is rather one of heavy impact than abrasion. Although the machine has made less than 2,000 trips at the present writing, several of the weaker types of pavements have shown signs of failure.

4. A Study of the Bearing Power of Subgrades as Affected by Moisture

It is common knowledge that whereas city pavements may stand exceedingly heavy traffic, those same pavements when laid on country highways develop weak spots and defects which require considerable maintenance. The difference between the city pavement and the country highway very obviously is that of drainage. The subgrade under city streets is generally in very much better condition than that of country highways because it is possible to keep the subgrade under city streets very much drier than the subgrades under country highways.

The bearing value of most soils is very greatly decreased by the presence of water, and one of our greatest problems in road construction today is to develop means for keeping water out of the subgrade. It would seem that our present day methods of drainage of roads do not always accomplish the purpose for which they were designed, and tests are being undertaken to discover means for enabling us to develop the bearing value of subgrades to the maximum possible extent. The experiments in this direction include experiments to determine the bearing value of soils containing different percentages of moisture, studies of capillarity in soils, and will include studies by means of models and full sized road sections to determine the best means for excluding water from the subgrade.

We are making an earnest effort to place road building on a much more scientific basis than exists at the present time. We should like to be able to gain enough knowledge so that having a given set of conditions of climate, subgrade and traffic, we shall be able to say with considerable certainty what constitutes the best type of road for those conditions. It would be very desirable if we were able to obtain information enabling us to say definitely that one type of road was comparable with another for carrying the same traffic. We believe that knowledge of this kind can only be had through tests of the character described, in conjunction with a study of the behavior of roads under service conditions.

Materials: The Development of Local Supplies

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local materials than when commercial supplies can be obtained at low cost.

The results of these investigations should be tabulated and information furnished to bidders with the proposal sheets. The information should contain the approximate location of the source given, in distance from the station of the highway; the kind of material, that is whether sandstone, etc.; description of the source, whether open quarry or ledge, sand bank or pit, stream bed, etc.; the quality of the material, and what classes or class of construction it is acceptable for.

The above information is absolutely essential, and additional information, such as amount of stripping or waste, might be given to advantage. Also where sand alone is to be used from a supply it would be a good guide to the contractor to know the approximate percentage of gravel and sand as ascertained by test.

When the prospective bidder receives this material information he must not by any means feel that he is relieved from all responsibility. The sole purpose of furnishing this information is a guide to inform him where suitable materials can be obtained. No state, to my knowledge, has ever attempted to guarantee material supplies, and the contractor must realize this. An investigation by the state must be made with thoroughness, but it is expected that all bidders will examine these locations and decide for themselves regarding their practicability as material sources. In working such sources a contractor must show a proper degree of cooperation. You know as well as I do, and possibly better, that the improper working of stone ledges and sand banks can ruin the good material they do contain. Every quarry and sand bank should be thoroughly stripped before the face is worked. Now this may sound elementary, but unfortunately the inspection of many quarries and banks has taught me that the matter is not thoroughly understood—at least not always attended to.

I realize that this discussion is before an organization of practical road builders, and I have especially aimed to avoid all technicalities. The details of investigation that have been suggested may seem in many instances unnecessary to some of you men, but after several years' experience in carrying on such work I am satisfied that we at least need this amount of detail; and additional information is always of great assistance. This work is so important that we should arrive at the stage of getting away from the "hit-miss" method, and the only way to do so is to take time enough and spend money enough to make a proper investigation of the proposed sources.

In many localities, especially in the Eastern States, that I am familiar with, there are many sources of highway materials that have never been investigated, let alone developed. The economic side of developing these supplies has never been a strong enough factor for their consideration, but necessity should certainly force their development.

To Fight Pennsylvania Bond Issue

Suit Brought to Prevent Issuance of the $50,000,000 of Road Bonds Voted in 1918

An equity suit to prevent the State of Pennsylvania from borrowing $50,000,000 for road construction, as authorized by the vote of the people at the general election of 1918 has been filed in the Dauphin County Court.

The plea asks the court to hold a hearing and then grant an injunction against Auditor General Charles A. Snyder and State Treasurer Kephart to prevent them from floating the road bonds. The papers were filed by Pittsburgh attorneys representing the Short Line Land Co. in the western part of the state and bear the name of former Lieutenant Governor Walter Lyon.

OOO

At a Recent Election at Denton, Texas, the state paving law was adopted as an ordinance.

Secretary of War Baker has asked Congress to appropriate $100,000 for building a road between Picatinny Arsenal and Spicertown, N. J.

The Issuance of $110,000 in Bonds for road and street improvements by Highland Park, Texas, has been approved by the Attorney General.

Surface Treated Macadam and Gravel

(Continued from page 100)

The refined tars applied cold have given particularly satisfactory results in this field and even where subsequent treatments have been made with asphalts, the first use of tar applied cold has been found advantageous.

Whether a macadam road is old or new it must be very thoroughly cleaned before surface treatments are applied. Brooming with steel wire rotary brooms followed by local hand work is good practice and care must be taken to clean the pavement down to clean stone. Caked material or dust on the surface prevents the bitumen from penetrating and from bonding onto the stone. Hot blanket coats require particularly thorough cleaning of the road. Sometimes a priming coat of cut-back bitumen applied cold helps in forming a bond.

The choice of one bituminous material that can be used to solve all the surface treatment problems that arise is a manifest impossibility. The kind and grade of bitumen must be varied to suit the kind and the size of stone used in the road crust, the expected volume and character of traffic, and its distribution through the seasons and the climatic conditions. In the face of all these variants, a choice of material and method is more often controlled by the funds available.

It pays to make a close study of local conditions and to get the benefit of the combined experience in any locality

The amount and kind of cover for the bituminous materials offer just as interesting a field for study as the bitumens themselves. The choice is often limited to what is available locally, but given a variety to choose from, little chance of mistake is made in choosing the hardest material possible and in using the largest sized particles that will be held by the bitumen. The amount used should be the least possible to protect the surface from picking up under traffic. It is better to add more subsequently than to use too much at first. A big excess wastes bitumen and may even destroy the coating by furnishing mineral aggregate in excess of the binding power of the bitumen.

Treatments of hot bitumens to be successful require good hard cover of the correct size. Unless this is used rolling and rutting are almost sure to occur. Stone as large as ¾ in. to 1¼ in. may sometimes be used to advantage.

As the cover and its application form a considerable part of the expense of surface treatment, the economic cost factors should be thoroughly studied. Some bitumens require much more cover than others and some require more expensive cover. As this extra cost may be in part offset by greater durability, the problem should be viewed from every angle.

Re-treatments call for special study, as the conditions are essentially different from the first treatment. Usually little sweeping is required and the patching is a much easier matter or may even be deferred until after the treatment is applied.

As a rule, the quantity of bitumen required for treatment is much less than for the original treatment. The road is already saturated with bitumen and a renewal and enlivening of the surface is generally all that is required. A macadam which absorbed ½ gal. originally can usually be retreated with ¼ gal. In subsequent re-treatments the amount may be still further reduced to advantage. Thickening of the mat is in most cases to be avoided, as it leads to rolling and rutting of the surface. Sometimes the same end can be gained by using a thiner bituminous material applied very sparingly.

The care and maintenance of surface coatings require careful thought to make it economical and effective. No surface treatments. Equally good results may, however, be obmade for taking care of the surface. The introduction of cold patching materials has made the care of surface treatments much easier. Much is gained by patching breaks and abrasions as soon as apparent. For this reason, patrol maintenance is particularly effective in taking care of surface treatments. Equally good results may, however, be obtained by gang maintenance with automobile equipment provided recurrent trips are frequent.

Surface treatment of gravel roads with anything more than dust layers may be said to be more or less in the experimental state. The distinct successes measured in permanence to date have been on gravel roads that to all intents and purposes were macadam roads. In discussing the question, the term gravel must be distinctly defined. The term is applied to a great variety of materials of differing sizes and mineral content.

In addition to variations in the material, gravel roads are built under widely varying specifications. No lasting surface treatments on a gravel road are possible unless the road as constructed is capable of sustaining the traffic that goes upon it. A surface treatment cannot supply drainage, a foundation, a base, or a thick bituminous wearing course. All that can be expected of it is to supply a protective coating that will conserve the surface from the abrasion of automobile traffic. Whether this coating is lasting or not depends wholly on the sustaining power of the structure.

Even if they are not lasting, these treatments may be economically justified. Gravel roads in the northern states, when well built and properly maintained, are never out of condition more than one month of the year, and that is in the spring when heavy hauling of any kind is usually out of the question in these districts. The lumber hauling is done on the snow and the crops are moved in the fall when the gravel road is at its best. The better road is hardly justified economically in many situations and yet something must be done to hold these roads against automobile traffic.

If surface applications at a cost of $600 to $800 per year can take the place of an expenditure of $15,000 to $40,000 per mile, they certainly are economically justified, since the yearly bill for interest, for amortization, for repair and renewal will be three to eight times the cost of surface treatments. The importance of intensive study and development in this field can not be too much emphasized.

The untreated gravel roads of the glaciated states are of great economic importance, since they may be built at a comparatively low cost and will sustain light traffic successfully. Traffic censuses on roads of this class show that they will take care of about 200 automobiles per day with the ordinary gravel maintenance methods of dragging and patrol. Beyond this traffic the surface becomes loose and the disintegration of the surface becomes serious. Dust laying oils alleviate the dust nuisance, but the oil destroys the natural bond of the gravel and causes much potholing.

In Maine and New Hampshire a system has been worked out using cold refined tars that enables these roads to carry 2,000 to 3,000 automobiles per day through the summer season. For the winter and spring the road crusts may break up, but as the traffic on these roads at that time is extremely light, and not of a heavy loaded type, it militates little against the success of this type of road and the surface treatment.

For the first treatment the road is dragged into good condition in the spring, with addition of new gravel if necessary. Application of sufficient gravel to amount to more than 2 in. should be made in the fall. After the road has dried out and hardened under traffic, it is swept with horse-brooms and the first application of cold refined tar applied. This is allowed to soak in without cover. A second treatment is then given. This is left without cover for four to six hours of

(Concluded on page 108)

HIGHWAY TRANSPORTATION

Traffic Control

The Part of Traffic Control in the Future of Highway Traffic

BY M. L. IRELAND*

Motor transport men with military experience talk mysteriously about traffic control. It is a subject uppermost in their minds as they recite their experiences. It is clear that they are not talking about that type of traffic control which one sees upon the city streets. As different ones describe it, military traffic control is something much more inclusive than the city type, but it seems difficult to find its boundaries, to determine its form and outline.

It seems proper to inquire just what is meant by this term and what part traffic control is to play in the future of highway transport.

Definition of Traffic Control

Traffic control is a function exercised by higher commanders to secure the best possible approach to the practicable passenger or ton-mile-hour capacity of roads and terminals. It cannot be exercised by lower commanders, because they are unable to make suitable provisions for: (a) Bringing new independent formations into the battle area; (b) coordination of highway and railroad traffic; (c) uniformity of traffic control regulations; (d) avoidance of diversity of authority over single routes: (e) deciding priorities of traffic on congested routes; (f) facilitating application of inter-allied traffic control regulations.

What Traffic Control is Not

Traffic control is not concerned with measures relating to the efficient use of vehicles, their suitability for their cargoes, proper loading, their fitness for service, nor for their road discipline, as individual vehicles or as organizations, when this road discipline affects only maintenance of vehicles, their appearance and like questions. These are questions of motor transport control (command). Traffic control is vitally concerned as soon as any of the above points affect the time that a vehicle takes in passing over a given stretch of road, which happens to be under traffic control, the degree of congestion on the road, and the wear and tear upon the road surface.

Traffic Control Comes as an Afterthought in the Acceptance of Motor Transport

Traffic control involves not only the giving of orders for the dispatching of transportation but more particularly that observation of how those dispatcher's orders are followed as to routes, time schedules, cargo loading, condition of vehicle en route, road discipline, etc.

In fact, dispatching of transportation follows immediately upon the purchase of the vehicles, either in civil or military experience.

Maintenance is the first lesson for the adventurer in the field of motor transport. The necessity for traffic control is the second lesson. The machinery constructed for putting traffic control into effect is usually first designed to be put upon the road only. The third lesson in the art is that the traffic control system, like its counterpart in railroad operation, must supplement and be a part of the dispatching system.

Traffic Control Develops from Expensive Experience in Motor Transportation

Traffic control is, therefore, a development from an expensive and chastening experience in amateurish handling of motor transport.

In the commercial world as well as in the military world, we have been accustomed to handling only small quantities of passengers or freight cargo on the highways. The skill and experience of our forefathers in operating the stage coach and the post road never developed into a heavy traffic as reckoned in present day quantities, and their experience has to a large extent died with them. The quantities which we have been accustomed to carry by highway never involved economic problems much beyond the single wagon load. The age of motor transport, while still in its infancy, has changed all of this.

The Forward Thrust Which the World War Gave to Highway Transport

The World War has brought us to a stage of development and knowledge of the possibilities of motor transport and the highway which we could not have reached for many years in peaceful experience, for the one reason that peace demands could not create a need for such large volumes of motor transport. Hence, for several years to come, the motor transport officers must be the pioneer in the development of the science of economic quantity transportation on the highway.

Traffic Control was Unnecessary Until the Advent of Motor Transport

Until the advent of motor transport no need for traffic control in either civil or military life had ever been experienced, which was sufficient to force the creation of special organizations for that purpose.

In previous wars the affairs of "the train" were almost beneath the dignity of more than passing attention from the mighty. The encumbrances and difficulties arising from problems of "the train" were almost like bad weather. They usually occurred at the same time. Hence, it was not difficult to divert attention from bungling, inefficiency, and ignorance of the importance of the train to the conveniently contemporaneous bad weather.

The Importance of the Military Train in the Eyes of Great Captains

A few great captains appreciated the bearing of the train and its affairs upon their success in campaigning. Napoleon did "the train" both a great service and a great injury when he coined the axiom that "an army marches upon its stomach." Putting his own interpretation upon his maxim, one which many commanders since his time have wholly missed, he improved his trains and thereby acquired a mobility which enabled him for years to defeat the larger forces of his enemy by a superior ability to get heavier concentrations at the proper point at the critical moment. The loss of horses in his trains, quite as much as his cavalry, told the story when the tide turned against him. He was no longer able to concentrate his inferior forces against one army at a time and beat his enemy in detail.

Other captains have dodged the problems by cutting loose from their bases and living upon the country as raiders. Sherman's march from Atlanta to the sea was in reality nothing more than a large scale raid from a base which could not be pushed forward to a new one.

Development of the Militry Train Had no Incentive

No incentive existed for the development of a science for handling military trains. The hopelessness of marked improvement under the limitations which impose themselves upon animal transport and the sacrifice of caste which any reforming genius would have to make, with scant hope for that encouragement necessary to put his schemes into practice, killed any marked advance in military train operations for thousands of years. Will motor transport be able in a few years to break the fettering bonds of these thousands of years of military habit? Will the present hopes for the future die because of the unreadiness, must we say sterility, of the soil upon which the seed is cast?

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*Colonel, Motor Transport Corps, U. S. A.

Motor Transport Uncovers a Defect in Napoleon's Maxim

Napoleon's injury to "the train" lies in burying its fortunes under but a portion of its burden, the load of supply. This matter escaped all attention until after the advent of motor transport, because the passenger load was carried upon the animal himself without a vehicle, and was called cavalry or mounted infantry. The great value of this flexibility of purpose of motor transport must be grasped.

New Light From the World Wai

"The train" had nothing to do with military passenger traffic worthy of any serious attention. The mounted service has always made in every other nation a strong appeal to the popular taste. The people have loved the spectacular side of the war — the rush of troops into battle in the nick of time. The work of the cavalry in the World War should not be belittled. It was almost everything which had not been expected of it. It was disappointing to the true cavalryman in almost every way. Not only did he not ride into battle on his charger (except in very rare instances) but he saw even the artillery horse ride into battle in a motor truck. And mounted infantry is an obsolete term except to describe the infantryman who is hurried over five to eight days' march in a motor truck in one day or less.

Motor Passenger Traffic Unites the Hope of "The Train" and the Hope of Victory

Not only does the hope of "the train" of the future lie in the fact that it has become the carrier of military passengers, but this fact carries with it the army's hope of victory. Army reserve trains and a traffic control, which can arrest for a moment ordinary routine supply traffic in order to give priority to emergency troop and supply movement by those army reserve trains, form a keystone of the bridge which must carry military traffic over war destroyed communications.

That Which the Successful Army Must Do

An army which aspires to an honorable record of fitness for its task, of sufficiency to meet the burdens and problems of modern warfare, which desires a chance for victory when it accepts battle, willingly or unwillingly, must acquire and retain superior mobility. This can be done only from a thorough understanding of the necessity for keeping the motor transport of an army "in hand" in larger reservoirs under the will of higher commanders.

That Which the Successful Army Must Not Do

That power of mobility given by motor transport must not be frittered away by a piece-meal distribution of prerequisites of position for anybody and everybody.

The supreme commander must not find himself blocked and thwarted in his efforts to stem an enemy offensive or to sieze a favorable opportunity for a counter offensive.

Available reserves of men, guns, supplies and motor transports must not be a useless luxury in a crisis, because the man who is fighting the battle cannot control either the roads or the motor transport.

Roads need not be blocked by the routine traffic of subordinate commanders. This traffic, if properly controlled. will find itself stopped only in one particular. It can no longer monopolize the full capacity of the road. It will find that it can accomplish quite as much in the same time by using its allotment of that road capacity.

And lastly, the commander on the field of battle, who holds the future of his nation in the hollow of his hand, must not see the opportunities, the hopes and the civilization of his race vanishing, because that all important mobility in a crisis is within his sight but beyond his control, enmeshed in the machinery of the service of supply. Why build so that we must have a commander both big enough in a crisis to find the designer's error and bold enough to break the machinery in order to make it work?

Traffic Control in Civil Life

Traffic control started in civil life. It will find that military traffic control has outstripped the civilian form. The part which fully developed traffic control is to play in civilian life is beyond the power of any person to predict because, in civil life, we are still too far away from concentration of traffic which taxes the 100% capacity of highways. It is still too easy to divert traffic to new routes, too easy to widen or otherwise improve congested streets. Even military traffic control is still in its infancy.

The highway problem is not yet sufficiently acute in civil life to demand an approach to the solution forced upon military men. When this time comes, the civil problem will be more difficult, because the traffic will lack that unity of purpose and discipline of military traffic. The civilian traffic current teems with individuality of purpose and restiveness under restraint or even guidance.

The solution will come in different form and more slowly both because the pressure of need for it will accumulate more slowly and because the solution must cope with rampant individuality. However the solution must come. The important centers of traffic already have tower control stations almost like the interlocking switch and signal towers of a great railway terminal. Lest the solution be disastrously late, the present is none too early to give to the matter the serious thought which it deserves.

Trucks Owned by 50,000 Farmers

Survey Conducted by the U. S. Department of Agriculture Shows Large Use of Motor Trucks in the Hauling of Farm Products

At least 50,000 farmers in the country own motor trucks which they use on their farms. This fact was shown by a preliminary survey of the ownership and use of motor trucks by farmers, which has been made by the Office of Farm Management and the Bureau of Crop Estimates of the U. S. Department of Agriculture.

The data on which figures for the nation and the several states were based were secured from about 35,000 selected crop reporters of the Bureau of Crop Estimates, it is stated. They were asked to give the names and addresses of farmers they knew owned trucks and used them on their farms. Passenger cars and trailers for use with passenger cars were excluded, and the reporters were asked to take no account of trucks used primarily for general custom hauling or on regularly established routes.

"The survey can scarcely be considered a complete census," according to the statement by the Department, "for it is probable that in some localities the crop reporters were not acquainted with all the truck owners, but it is certain that a very large per cent. have been listed. It is believed that in no state were less than 75% of the trucks reported. If not complete in every respect, the figures show the relative distribution very satisfactorily."

The exact number of trucks reported was 49,195, and they were distributed as follows:

Alabama, 847; Arizona, 95; Arkansas, 721; California, 1,019; Colorado, 804; Connecticut, 357; Delaware, 100;

(Concluded on page 108).

MEETINGS

Calendar of Coming Meetings

Feb. 18-19—Associated General Contractors of America—Annual Meeting, Chicago, Ill. Secretary, 111 West Washington St., Chicago, Ill.

Feb. 26-28—Southern Appalachian Good Roads Association.—Tenth Annual Meeting, Asheville, N. C. President, A. D. Williams, Parkersburg, W. Va.

Apr. 12-17—United States Good Roads Association—Eighth Annual Convention, Hot Springs, Ark. Director General, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

Apr. 16-17—Bankhead National Highway Association—Fourth Annual Convention, Hot Springs, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

Iowa Road Officials' Conference

The seventh annual conference of county engineers, supervisors, township trustees and other road officials of Iowa will be held at the office of the State Highway Commission at Ames, on Tuesday, Wednesday and Thursday, February 24, 25 and 26.

The conference has been called for the discussion of important matters in connection with administrative and engineering features of work under the new Iowa law governing federal and state aid in road building. Iowa has a very extensive program prepared for the coming season, and has invited to the conference a number of engineers from other states of the Midlde West, where road building problems are similar to those in Iowa. H. K. Bishop, Chief Engineer of Construction of the Indiana State Highway Commission, and Clifford Older, Chief Engineer of the Division of Highways, Illinois Department of Public Work and Buildings, have already accepted invitations.

In calling this conference the Iowa Highway Commission has asked that salesman for machinery, material and equipment manufacturers and dealers remain away from Ames during the conference, because those in attendance are expected to give their entire time to the work in hand, and also because all available hotel accommodations are needed for them.

OBITUARY

John W. Wilcox, for the past 16 years city engineer of Macon, Ga., died recently at Saluda, N. C.

George E. Blakeslee, a member of the New Jersey State Highway Commission, recently died after a short illness.

Charles D. Bray, for nearly 40 years in the mechanical and engineering departments of Tufts College, died recently of pneumonia. He was active in engineering society circles and served on many public commissions.

Fred Creelman, Secretary-Treasurer of the C. L. Hyde Construction Co., of San Diego, Cal., died recently at his home in that city after a short illness. The C. L. Hyde Construction Co. has been active in highway construction work and has built some of the mountain roads connecting the coast and the Imperial Valley in southern California.

PERSONAL MENTION

Arthur Parker has been appointed city engineer of Cheyenne, Wyo.

Walter B. Hogan has been appointed city engineer of Stockton, Cal.

N. R. Dinsmore has been appointed superintendent of street repairs of Akron, O.

Robert T. Jacobson has succeeded Frank L. Anders as city engineer of Fargo, N. D.

Silas W. McConnell has succeeded John Leech as city engineer of Steubenville, O.

Eli Abbott was recently appointed highway engineer of Leflore County, Mississippi.

F. W. Probst has been detailed to field work in the western part of Missouri by the Barrett Co.

William Warning has been placed in charge of the Boston office of the Lakewood Engineering Co.

Green Slade has been appointed highway engineer for the Tenth Congressional District of Georgia.

W. H. Johnston, Reno, Nev., has been appointed a member of the Nevada State Highway Commission.

H. A. Marshall was recently appointed first assistant engineer of the Kansas State Highway Commission.

Leslie H. Belknap has succeeded W. W. Cox as chief engineer of the Michigan State Highway Department.

C. W. West, of Buchanan, Va., has been appointed county road engineer of the Houghton County Road Commission.

Cecil L. Road, County Engineer of Lucas County, Ohio, has been elected president of the Ohio Engineering Society.

L. B. Hitchcock, City Engineer of Phoenix, Ariz., has been elected president of the Phoenix Chapter of the A. A. E.

George A. Seymour, Royal Oak, Md., was recently appointed county road engineer of Talbot County, Maryland.

Louis Beauman was recently elected engineer in charge of the Highway Maintenance Department of San Joaquin County, Cal.

Robert B. Paterson, formerly Field Engineer of the Utah State Road Commission, is now road engineer of Utah County.

N. M. McCluskey, of Clovis, N. M., was recently appointed district highway engineer of the Clovis district, succeeding D. W. Jones.

John J. Griffith, County Surveyor of Marion County, Indiana, has been elected president of the Indiana County Surveyors' Association.

Karl Riddle, formerly County Engineer of Dickinson County, Kansas, has been appointed resident engineer on federal aid work in that county.

Harry Conrad, who was formerly associated with Orion Koller in the practice of engineering at Wheeling, W. Va., is now city engineer in that city.

Frank S. Altman and G. W. Branch, both former captains in the engineering corps, have been detailed to territories in Kansas by the Portland Cement Association.

F. L. Scott, Eldred, Pa., has been recently appointed superintendent of state roads for McKean County, Pennsylvania.

G. V. S. Skelton, head of the Engineering Department of the Oregon Agricultural College, has been elected president of the Northwest society of Highway Engineers.

J. von Carlowitz, formerly with the Texas State Highway Department, is now statistican in the producing department of the Pierce Oil Corporation, Fort Worth, Texas.

M. O. Bellingrod, Assistant Engineer of the Georgia & Florida Railway Co., has been appointed assistant division engineer in the Georgia State Highway Department.

George E. Datesman, Philadelphia, Pa., has opened offices in that city as consulting municipal engineer. Mr. Datesman was formerly director of public works of Philadelphia.

Frank C. Snow, Assistant Professor of Civil Engineering in the Montana State College, has been appointed professor of highway engineering at the Georgia School of Technology.

H. S. Mullican, formerly County Engineer of Davidson County, North Carolina, is now consulting engineer on hard-surfaced road construction and location revisions in that county.

———OOO———

Surface Treated Macadam and Gravel

(Concluded from page 104)

sunshine and then if any liquid remains on top, enough cover is used to blot up the excess.

Patrol maintenance is given these roads and is necessary to economically maintain them. All bank gravels run uneven, so that dust pockets exist in these roads which sooner or later break out. The breaks are easily repaired with tar and gravel, if attended to immediately, but if neglected spread and threaten the whole road.

The roads may or may not break up in the spring, depending on the road and the weather. After hard winters such as 1917-18 they do not break. After open winters like 1918-19 the road usually breaks when the frost is coming out of the ground. In case the road does not break, it is repaired and retreated like a macadam road. In case the road breaks, it is shaped up and dragged back into condition like an ordinary gravel road. In either case, a single retreatment of ¼ gal. per square yard is usually sufficient to put the road in good shape for the season's traffic.

If the road goes through several seasons without breaking up, it is usually necessary to break it artificially, as the road through frost action and heavy traffic gradually loses its shape. A road roller with spikes in the wheels, a steam scarifier and a harrow are effective tools on this work. After the road is reshaped it is retreated and maintained as before. However, as the gravel is stuck together in lumps, the road acts more like a macadam and will go a much longer period before it requires breaking a second time.

Similar experiments have been carried on in the South and Southwest over a variety of gravels. Success has been dependent on the care taken in the selection and preparation of the original road and in the care taken with the treatments and their subsequent maintenance. These experiments have proved here, as elsewhere, the futility of surface treatments over gravel and similar materials without provision being made for constant and intelligent maintenance.

The absence of frost makes this treatment often successful in the South, where failure would be expected in the North. On the other hand, the high summer temperatures long continued make it imperative to choose bitumens and methods which will eliminate as far as possible tendency to roll and rut. The refined tars of the cold application type, at least for the priming coat, have been most successful. For the finishing coat, bitumens heavy enough to apply hot have given good results, if a cover compound of hard rock and sizes up to 1 in. has been used.

Surface treatments blend gradually into penetration work. It is hard to draw the distinction between a heavy surface treatment of hot bitumen, put on in two coatings, using large stones for cover, and a light resurfacing job by the layer method. From an engineering standpoint, the difference comes mainly in the end to be desired and the methods employed in doing the work. From a mental attitude, it is generally safer to figure on a real penetration job if heavy topping is aimed at, rather than to take the standpoint of a surface treatment.

Work of any description that leads to real economy in road work, to the saving of past investments and to the rectification of past errors is of the utmost importance at the present time. Engineers are so busy with new construction problems that they are prone to forget that present economic conditions are such that the salvage of an old pavement in an economic manner is almost more important than new construction. At present prices, it pays to save. If we lose sight of road economics in a wantom waste of public funds, there will be a day of reckoning. What is called for at the present time is economy and thrift in private and public work. No other course will lead us out of the present unstable conditions.

———OOO———

Trucks Owned by 50,000 Farmers

(Concluded from page 106)

Florida, 380; Georgia, 1,808; Idaho, 329; Illinois, 2,261; Indiana, 1,548; Iowa, 2,773; Kansas, 1,732; Kentucky, 818; Louisiana, 310; Maine, 435; Maryland, 596; Massachusetts, 661; Michigan, 1,636; Minnesota, 1,255; Mississippi, 957; Missouri, 2,065; Montana, 359; Nebraska, 2,739; Nevada, 41; New Hampshire, 283; New Jersey, 862; New Mexico, 104; New York, 3,171; North Carolina, 1,450; North Dakota, 501; Ohio, 2,261; Oklahoma, 723; Oregon, 369; Pennsylvania, 2,760; Rhode Island, 152; South Carolina, 1,190; South Dakota, 1,708; Tennessee, 978; Texas, 1,668; Utah, 173; Vermont, 282; Virginia, 1,128; Washington, 682; West Virginia, 465; Wisconsin, 1,465; Wyoming 174.

———OOO———

A Bond Issue of $125,000 was voted in Arlington, Texas, recently for street improvements.

The City Commission of Clarendon, Texas, has awarded a contract to the Panhandle Construction Co. for 18 blocks of brick paving through the residential section of the city.

A New Federal Road District comprising the states of Montana and Idaho has been formed by the United States Bureau of Public Roads. The new district, No. 11, will be in charge of F. M. Keene.

The Committee on Constitutional Revision of Pennsylvania has adopted a proposed amendment which will permit the issuance of bonds by the state to improve highways to the extent of $150,000,000, the action to be indorsed by a two-thirds vote of the State Legislature and then be ratified by the people.

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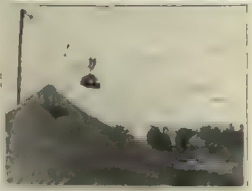
SAUERMAN
DRAGLINE CABLEWAY EXCAVATORS



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Old Series, Vol. LVIII
New Series, Vol. XVIV

NEW YORK, FEBRUARY 25, 1920

Numbe
8

The Roads of France

By MAJ. HENRY WELLES DURHAM*

> *"They order," said I, "this matter better in France."*
>
> *"You have been in France?" said my gentleman, turning quick upon me with the most civil triumph in the world.*
>
> *"Strange!" quoth I, debating the matter with myself; "that one-and-twenty miles sailing (for 'tis absolutely no further from Dover to Calais) should give a man these rights. I'll look into them."*

The writer chose this quotation as an appropriate text for a book written some years ago as the result of a tour of investigation prompted by the easy criticisms of those who confused asseration with demonstration, and its sentiment appeals today to one who has listened for years to floods of talk on the superiority of French roads, usually based on a motor ride from Paris to Versailles and a few genial words during a casual visit to a polite French road engineer. It is doubtful if the minutes of any road discussion in this country during the past ten years fail to contain arguments founded on the alleged practices in Liverpool and Paris (evidently, all tourists follow the same route) whose engineers would be interested to learn the wide range of practice ascribed to them.

VIEW ON NATIONAL HIGHWAY NO. 16
BETWEEN PARIS AND CHANTILLY

A ROAD SITUATED INSIDE THE FORMER
BOCHE LINES BACK OF ST. MIHIEL

Recently in a successful attempt, not to observe, but to accomplish a better order of things, over two million Americans have traveled in France and for years to come "I was there" will be a conclusive argument for many a speaker and writer to prove innumerable results in comparison between our ways and those of our Allies. Unfortunately, traveling does not confer powers of observation, nor does observation necessarily accompany ability to know the explanation for what is observed. The abnormal conditions under which tourists and soldiers live, give rise to many erroneous deductions, and even the trained observer on a hasty personally conducted inspection trip makes many conclusions which would be reversed by a more thorough study. At present our literature and the talk of returned members of the A. E. F. is full of allusions to French roads. Accordingly, as the narrator observed them from a position immediately above, either a pair of hob-nailed issue shoes or the soft cushions of a limousine car, we learn that they are mainly streaks of mud or magnificent avenues best suited to an average velocity of 50 mi. per hour with no stops for chickens or dogs. We are told that they were built by the Romans and have needed no improvement since, or that they are a heritage from Napolean who laid them out on a map of France with a rule.

It is the writer's thought that a short outline of what the French road system is, may be of interest to those who would make comparisons with ours. A detailed history of what is really the only complete national highway system in existence cannot of course, be attempted here. Its growth is a

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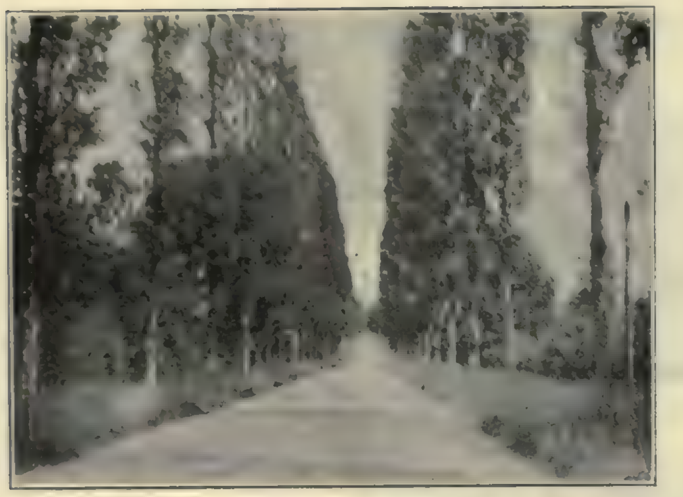
*Lately Major of Engineers, U. S. A., in charge of Road Section, Department of Construction and Forestry, A. E. F.



A FRENCH DEPARTMENTAL ROAD

A FRENCH COMMUNAL ROAD

logical outcome of France's geographic position as the hub of the civilized world. Her territory has been the highway of Europe for over two thousand years and has furnished the lines of communication and most of the battlefields for the armies of Europe, as well as the main routes of commerce. Ever since Caesar's time the world's traffic lines have crossed her territory and some of his roads are still in use to help the legend that he built the highways of France.

It is desirable to note briefly some physical conditions which have in part affected the growth of the road system as they have affected her historically. The latitude of the country corresponds to the northern part of ours west of the great lakes. Its climate more nearly resembles our mid-southern states, with extremes of heat and cold moderated by west winds from the gulf stream. Contrary to the soldier's belief, the rainfall is less than ours, varying from 20 to 40 in. annually. During spring, summer and autumn, Paris has as much sunshine as New York, but in winter 10 to 15% more cloudiness. Most prevalent popular impressions of French climate originated in the muddy winter camps of Brittany and the Northeast and were emphasized by billets in unheated, damp, stone, peasants' homes. The area of the country is less than that of Texas and more than that of our most populous region, the group of northeastern states on the Atlantic seaboard north of Washington. Its population of nearly 40,000,000 is a little less than 50% greater than that occupying the latter region in our country, but is more evenly distributed. In shape it is roughly rectangular, 360 mi. in longitude by 400 mi. in latitude, with the Brittany peninsula projecting from the northwest corner, and the triangle containing the British battle areas on the north. In great part it consists of lowlands and moderately elevated uplands. Its only lofty mountain regions are along its Spanish border and adjoining Switzerland and Italy to the southeast. The highest interior areas, the Central Highlands, separates its Mediterranean lowlands from the northern half of the country by a region of ancient lava flows and extinct volcanoes whose maximum summits reach 6,000 ft. in elevation and form a barrier which since earliest times has thrown traffic coming into the country from the south into two distinct routes. The principal one of these, up the valley of the Rhone, forms the natural road to the center and north, with another one westward to the low plains of Gascony and the fertile area about Bordeaux. Thus the location of the main centers of population with their connecting highways, which form the skeleton of the present system, were largely determined by the geographic features which directed the early invasions, and the main highways used by the American Army followed the lines that the Romans developed.

Most important of these routes were four: 1, north from Marseille through Lyon to Paris and Boulogne; 2, east from Brest to the Loire Valley and past Bourges and Autun to the Rhine; 3 from Italy to Marseille and west to the region about Bordeaux; 4, from Bordeaux passing north of the Highlands to Lyon.

Along this skeleton reaching to the principal ports grew

NATIONAL HIGHWAY NO. 44 BETWEEN ST. QUENTIN AND CAMBRAI—SHOWING A REPAIRED DETOUR AROUND A MINE CRATER

NATIONAL HIGHWAY NO. 44 ALONG THE HINDENBURG LINE NEAR THE ST. QUENTIN CANAL TUNNEL—AFTER THE ARMISTICE

A BELGIAN HIGHWAY NEAR YPRES

REPAIRING NATIONAL ROAD NO. 73

up the main centers of population through the centuries and over these routes American trucks took up the chase begun by Caesar's chariots in pursuit of the "barbarians who dwell beyond the Rhine."

Eventually, as France evolved from a collection of minor principalities to a powerful centrally controlled kingdom, Paris outstripped other centers in importance and became not only the seat of government but the center of commerce and population till now it equals in number of inhabitants the fourteen cities next in size, and assumes an importance which no American city bears to our country. With the growth of absolute monarchy, state roads were developed after the Roman model as regards alignment, following straight routes between important point, as nearly as possible ignoring minor contour development and disregarding local property rights, radiating from Paris to all points of importance in the kingdom. Other radiating systems from these points connected them with each other, while between these there grew up an intricate network of local roads usually conforming to topographical conditions.

Thus, geographically, the present road system is ancient. Physically it is modern. The main royal roads radiating from Paris were paved in the days of the kings with large blocks or cobbles, and the national supervision of main highways in an organized fashion is 400 years old. But ordinary roads were dirt tracks and there existed few good means of communication between the provinces. A unified system of good roads is a growth of the past two centuries and has largely developed since the introduction of broken stone road construction at the beginning of the 19th century. Complete highway control by the nation under its Department of Public Works, with a comprehensive and continuous plan for development, construction and maintenance, has attained its present form in the period since the Revolution. The results of this policy at the time when motor vehicles became a factor in the road problem gave the country a complete highway plan comprising: National roads 24,000 mi.; departmental roads, 18,500 mi.; all other minor roads, 375,000 mi.

This category includes all public highways excepting city streets. National roads connect Paris with the other great centers and the latter with each other. Departmental roads run between important towns of lesser size. The former are maintained by the nation, the latter by each of the 87 departments, which occupy a position in size and importance midway between our counties and states. Of still less importance nationally, but accommodating much local traffic, the chemins de grande communication are also supported by the departments. The great balance of minor roads, is again divided several times into classes according to importance, and depends for its care upon the communes and villages. In all classes, however, the same methods and system of construction and repair prevail, and all are subject to supervision by the national road organization.

An inspection of the map is necessary in order to appreciate the thorough manner in which the national highways cover the country. From Paris over a dozen routes radiate

A ROMAN ROAD STILL IN USE FOR A SHORT DISTANCE FOR LOCAL TRAFFIC IN THE VICINITY OF BOURGES

VIEW ON NATIONAL HIGHWAY NO. 7 NEAR ORANGE IN THE LOWER RHONE VALLEY—OLD ROMAN ARCH.

in all directions, like the main threads of a web, connecting the capital with all the ports and interior cities. Route No. 1 leads to Boulgone, No. 2 to the Meuse Valley and Belgium, No. 3 Metz, No. 4 Nancy and Strasbourg, No. 5 to Dijon and Switzerland, Nos. 6, 7 and 8 to Lyon and Marseille. Branching from No. 7 at Moulins, No. 9 leads to the Mediterranean and Spain, while No. 10 goes through Tours, Bordeaux and Bayonne to the Spanish border in the southwest, with a branch, No. 11, to La Rochelle. No. 12 connects Paris with Brest, No. 13 with Cherbourg and No. 14 with Rouen and Le Havre, while No. 15 to Dieppe and No. 16 and No. 17 to Dunkerque and Lille complete the series of spokes in the main wheel. A similar radiating group leads from each of the important interior cities and coast towns, the whole giving convenient and reasonably direct routes of the national system between any two important points in the country.

Those whose knowledge of these roads has been restricted to the neighborhood of Paris picture them all as straight and nearly level. Those who have been to Compiegne or Fontainbleau report that all national highways are paved with stone blocks, the Versailles tourists think of them as mainly asphalt, and the bold spirits who have ventured out on Route No. 10 (famous as the Biarritz-Paris motor race-course of years ago) to Chartres or beyond add to the number of those who know that all French roads are macadamized with white limestone.

To realize that more engineering than the ability to draw straight lines on a map has gone into France's road plan, it is necessary to see it in all parts of the country, along the course of No. 9, for example, in the upper valley of the Allier, where the stream, railroad and highway cross and recross each other in the attempt to find space for the three in a valley barely wide enough for a water course, or the route over the divide between Murat and Aurillac, which climbs down to the former city from St. Flour by a series of hairpin turns on the face of a cliff from the plateau above and reaches the western slope of the central highlands through a tunnel built 75 years ago over a mile in length at an elevation of 3,000 ft. and immediately above a railroad tunnel and below the summit peak of the Cantal. The stone arch bridge across the Loire at Tours dates from the time of Napoleon and is one of the finest and most substantial structures of its kind in existence, while route No. 165 crosses an estuary of the sea in Brittany on a recently built three-hinged latticed steel arch of over 400 ft. span from which the floor system is suspended somewhat like that of the Hell Gate arch in this country, the whole giving a cobwebby effect of lightness in appearance, yet carrying a narrow gauge railroad in addition to the brick paved roadway. Another example of fine modern steel construction is the high level latticed truss with long viaduct approaches carrying route No. 10 over the navigable Dordogne near Bordeaux with a wood paved roadway in excellent condition after its wartime lack of maintenance. In all parts of the country are noticeable both the skill shown in developing the plan to conform to difficult topography, while maintaining a direct route, and the evidence of continuous effort to keep abreast of modern progress and provide for changed traffic conditions.

Furnshing important cross connections between national routes or joining places locally but not nationally important the departmental roads, similar in type to the national, add to the main threads in the web an almost equal mileage. Many of them were of great importance to the A. E. F. whose routes often cut across former established traffic lines.

Finally, the local roads with a mileage nine times that of the two more important classes cover the country so completely that it is usually possible to travel between any two points on routes of this character, avoiding the main lines entirely. The roads are less direct, often crooked and frequently narrow, but always with a macadam surface passable for any class of wheeled traffic and often, especially during the war, in better shape than the over-taxed national roads.

A few general details are of interest: Grades except in hill country are usually below 3%. Long tangents prevail, due to the ability of the planner to disregard local property lines which introduce so many angles in British and eastern American roads. All bridges and culverts are of masonry, except for some steel or concrete railroad crossing viaducts, a few modern long span bridges and a number of old suspension spans of composite iron and wood construction. With the exception of the latter class there are no limits placed on bridge loads. Some of the more ancient of the bridges have very narrow roadways, in some cases only single track. Skew masonry arches, both under and over railroads, are usual. Highway tunnels are wide enough for two lines of traffic and in the mountains protected at the ends by a pair of staggered half doors glazed to admit light and so arranged that entering or leaving traffic must slow up to pass first to right and then to left thus discouraging speeding and stopping air currents. Tunnels are lighted and guarded by watchmen. Mountain roads and those along river banks have protecting stone parapets or a series of stone posts on the exposed side.

Ordinarily the national roads vary in width from 20 to 30 ft., including berms and between ditches. A notable exception to the straight and wide class is Route No. 152 which formed part of the A. E. F. main line of communication from St. Nazaire to the front. Between Angers and Tours, about 70 mi., it occupies the top of a sinuous dike built to hold back the floods of the lower Loire, is barely wide enough for two motor trucks to pass in safety and is connected to a summit against the protecting masonry wall on the river side with all drainage carried by a gutter on the other. On the other extreme are some of the roads in the lower Rhone Valley which are wider than elsewhere. The most usual cross sections however consist of a carriageway, 16 to 20 ft. in width. Telford foundations are by no means universal, but are used to a large extent, especially in low wet ground or on fills.

Abutting the stone surface on either size is usually a raised berm 3 to 6 ft. in width (sometimes more), generally grass grown, and forming a footway as well as a curb to keep wheel traffic on the road metal.

Surface drainage is carried by small cross ditches at intervals from 15 to 25 ft., from the gutter formed by the berm, into the main wide longitudinal ditches which are one of the most prominent and important features of French roads. These ditches are low enough to keep any ground water well below the road base and are graded to meet natural intersecting water-courses. Crowns are low, as a rule. Flat crowns frequently occurred during the war, due to lack of resurfacing.

The right of way is usually sufficient to permit of future widening of the traveled way; frequently from 50 to 60 ft. Each kilometer is marked by a stone monument bearing on each face the route number, consecutive number and distances to important points. Intervening distance is divided into tenths by smaller monuments. Trees are usually spaced 100 to the kilometer, sometimes 50 when they are especially large. One line of trees occupies each berm. Sometimes with a berm of extra width there are two lines. In other cases a second row marks each property line. These trees are undoubtedly the best known feature of French highways. According to our artists they were all poplars and during the war were either destroyed by the Boche out of spite or cut down for our own use as firewood. As a matter of fact while there are many poplar avenues in the country many other varieties of roadside trees abound, including willows from whose branches annual crops of small firewood is cut as well as linden, magnolia, various kinds of evergreens and many miles of fruit trees most grateful to the pedestrian in summer. Many avenues have succumbed to war conditions or necessities, but in most cases new trees have already been planted in their places or soon will be and it was not their cutting that was unusual, that being a custom when a tree attains old age, but the necessity of doing so much in a short time. The trees are an integral part of the road plan, furnishing shade to prevent dust to some extent and conserve moisture and there is little danger of their disappearance in a country with as careful a system of foresting as prevails in France.

At each road intersection stands an iron post with route indicator arms of cast iron with raised letters giving directions and route designations. Minor roads are usually equally well marked. Their surfaces resemble the national roads in appearance but the road metal is thin often without telford base, and the carriageway is narrow often single track but with berms or shoulders low to permit of turning out.

National highways often lose their identity in passing through towns, becoming narrow and crooked, with stone block pavements. Usually there has been little change in the old street plan since the middle ages. The larger cities however frequently carry the national roads through their main thoroughfares widened and straightened. In some cases to favor better alignment the national road passes outside of old mediaeval towns, connecting with them by branch roads and often a new modern city has grown up on a rectangular plan about the thoroughfare, leaving the older town still within its ancient walls.

Present standard construction on national highways calls for a foundation of hand packed stone about 10 in. in thickness except when the subgrade itself is of sufficient hardness. Either with or without this foundation the road contains from 5 to 8 in. of crushed rock, usually placed in two layers of 2½-in. and 1½-in. stone. The latter is bound with fine screenings and loam thoroughly flushed during rolling. Characteristic of the system is intense rolling with 12 to 18-ton rollers and the use of loam binder and much water. Maintenance involve continual filling of pot-holes, however small, frequent scraping of mud and dust to one side and respreading of the latter to avoid loss of binder. Cantonniers keep themselves supplied with repair material by breaking field stone with hand-hammers. Resurfacing is carried on from time to time with a layer of new material of 2 to 3 in. when the old surface becomes too worn for minor repairs. Ditches are kept constantly open and water does not stand on the surface.

Belgian block paving was formerly employed on the heaviest traveled national roads. This was naturally most used on the roads nearest the source of supply in northern France and Belgium and to a considerable extent in the marshy flat country about La Rochelle, Rochefort and south of Bordeaux, ports to which materials could easily be shipped by water. The policy in recent years has been to replace stone block paving with macadam when reconstruction became necessary, but nearly 2,000 mi. of it still remain on the national roads, including some of the most important routes, and much of the war traffic, particularly in the British Army areas, was over this type of surface. Its condition today compares favorably with the usual European city block paving. The blocks, usually from a porphyry or basaltic rock, are set directly on the subgrade with a raised row along either edge to form a curb, and with joints filled with sand or fine gravel.

Material for macadam construction varies much in quality. The French Road Department originated the making of tests to determine suitable characteristics and has classified the rocks from all available sources. Of necessity a large proportion of road construction has been done with local material to avoid long hauls, and the prevailing surface rock over a large part of the country is a soft limestone. Frequent deposits of siliceous material occur however, in this and these are extracted in small surface quarries hand worked along the route or in the fields adjacent. For the more important routes material is transported from large hard rock quarries of trap, basalt, quartzite and granitic rocks found in the Northwest, Brittany and Normandy, in Burgundy and the Vosges and Jura regions, the Center, the Vendee and adjacent to the Alps and Pyrenees The Road Department has quarries in all these regions, both under contract and nationally exploited, and has long used their material on all its best work. Many roads also, notably in the valley of the Loire and its tributaries, are constructed of gravel taken from the river bed at low water or from surface deposits.

Considering briefly the traffic using these roads, it is the writer's opinion, based on observation before, during and after the war, and on opinions and observations of French road authorities in all parts of the country, that France has much the same motor problem to meet as have we. In fact, the motor vehicle was first developed abroad and road races were run on French roads when the "horseless carriage" was barely known in New York. Before the outbreak of the war with Germany the increase in motor travel was causing worry to French road engineers, but with them the problem related to the wearing surface needed to meet changed traffic—not as with us involving the necessity of developing a new system of trunk lines for the use of a type of vehicle increasing faster than we could build roads for them. The existing hard roads had solid foundations in most cases, to carry any traffic that could be prevented from tearing their surfaces and before the war a beginning had been made in surface protection at some points, as can be seen on roads about Paris for example. It is of interest to note a surface tar carpet on Route No. 23 for several miles near Nantes, a road that formed there one of the links in the main A. E. F. route for its motor convoys, which was in good condition in July of last year, having had no maintenance since before the war. While use of the automobile has not developed as fast as it has in our country it is not the fact that French road traffic is restricted to farmers' carts. During war-time in areas away from army activities one saw little beside horse-drawn traffic, for private use of motors, aside from those required in the work of essential industries, was prohibited to save gasoline. But with the lifting of restrictions last year, touring began and the past summer cars were circulating in large numbers again, while many army camions purchased by private parties could be found on all roads. Over 200,000 motor vehicles, exclusive of military tractors and tanks were in use with the armies on the French front and a large proportion of these are finding their way into civilian use, in addition to those previously owned and the new ones whose manufacture has begun in the factories returned to industrial life.

Before the war the Road Department was barely keeping pace, under its maintenance appropriation, with the destruction due to the motor car. It had ceased to effect improvement and was planning to obtain increased funds.

With the war, maintenance, on other than a small scale ceased outside the zone of the Armies. Within that area was concentrated the efforts of a militarized service of roads, largely made up of former civilian personnel, and for five years the national roads have got on as best they might, aided only in their resistance to deterioration by former good construction and a reduced circulation.

Summarizing the facts from among the mass of opinions brought home from France, it is unquestionably true that in all points of general plan and in most items of detail and auxiliary construction the French road system leaves little room for improvement. It is also a fact that the majority of roads show decided wear and loss of metal, crowns have become flattened, and to maintain former standards a thorough overhauling is necessary, with the addition of a less rapidly wearing surface on main routes. At best they are dusty in dry weather, which not only causes a nuisance to travelers and adjacent property, but the annual loss of an enormous volume of expensive road metal. An estimate by the writer, based on observed wear, indicated the loss on highways due to the traffic of the A. E. F. of an amount in excess of 1,000,000 cu. yd.

Three principal points have served to give French roads their pre-eminence, all of them important today and worthy of imitation.

(1.) The national system of control, removed from political changes, from the Paris headquarters down through the Departmental heads and local organizations to the cantonniers, each with his few kilometers to patrol.

(2.) A complete plan and an original layout adequate today with few exceptions, avoiding the necessity of expensive reconstruction to meet modern conditions, and including a proper design of detail, taking care of that essential, drainage.

(3.) And finally continuous maintenance, involving the policy of always keeping roads in repair with constant attention to minor defects and periodic resurfacing.

With a century of such a system behind them French road engineers, even though faced today with enormous problems, posses a foundation to build on for the future that may well be the cause of envy to our ephemeral road officials as they contemplate the construction of their pyramids from the apex down, or such portions as their brief official life permits.

Short Course in Highway Engineers at the University of Michigan

The Sixth Annual Short Course in Highway Engineering of the University of Michigan is being held during the present week.

The course is given under the direction of the College of Engineering of the University, in cooperation with the Michigan State Highway Department, and is open to all highway commissioners, engineers and others interested in road construction and maintenance. No fees are charged by the University, but all wising to take the course are obliged to register. The sesssions are held in Room 348 of the Engineering Building and all laboratory instruction is given in the Highway Laboratory.

Registration began at 8:00 a. m., Monday, Feb. 23, and the first session was held at 1:30 a. m., Monday. The program follows:

Monday, Feb. 23, 1:30 p. m.

Address of Welcome, by Dr. H. B. Hutchins, President of the University of Michigan.

"Highway Engineering at the University of Michigan," by Dr. M. E. Cooley, Dean of the College of Engineering and Architecture, University of Michigan.

"Highway Transport at the University of Michigan," by Henry E. Riggs, Professor of Civil Engineering, University of Michigan.

"Progress in Road Improvement in Michigan during 1919 and the Outlook for 1920," by Frank R. Rogers, State Highway Commissioner of Michigan.

"Drainage and Foundations as Affected by Geological Conditions," by Charles J. Bennett, State Highway Commissioner of Connecticut.

Monday, Feb. 23, 8:00 p. m.

Smoker, Michigan Union; H. S. Earle, Presiding Officer.

Tuesday, Feb. 24, 9:00 a. m.

"Economic Methods of Constructing Gravel and Broken Stone Roads," by R. W .Roberts, District Engineer, Michigan State Highway Department.

"Efficient Methods of Maintaining Gravel and Broken Stone Roads," by G. C. Dillman, Maintenance Engineer, Michigan State Highway Department.

Tuesday, Feb. 24, 1:30 p. m

"Bituminous Surface Treatments on Broken Stone Roads," by W. W. Cox, Engineer-Manager, St. Clair County Road Commission.

"Essentials of the Construction of Bituminous Macadam and Bituminous Concrete Pavements," by Arthur H. Blanchard, Professor of Highway Engineering, University of Michigan.

Tuesday, Feb. 24, 6:30 p. m.

Informal Dinner, Banquet Hall, Michigan Union; Dr. M. E. Cooley, Presiding Officer.

Illustrated lecture on "Efficient Methods of Snow Removal from State, County and Town Highways," by Raymond Beck, Chief, Goodrich Travel and Transportation Bureau.

Wednesday, Feb. 25, 9:00 a. m.

"Efficient Detours for Highways Under Construction," by L. H. Neilsen, Deputy State Highway Commissioner of Michigan.

"Economic Value of a Road Material Survey," by J. H. Bateman, Assistant Professor of Civil Engineering, University of Michigan, and Director, Michigan State Highway Laboratory.

Wednesday, Feb. 25, 1:30 p. m.

"Economic Selection of Roadway Surfaces for State, County and Town Highways," by George W. Tillson, Consulting Engineer, La Grange, Ill.

"Relation of Highway Transport Surveys to the Economic Design of Highways," by Arthur H. Blanchard, Professor of Highway Engineering, University of Michigan.

Thursday, Feb. 26, 9:00 a. m.

Road Commissioners' Meeting

Chairman, Frank F. Rogers, State Highway Commissioner of Michigan.

"Efficient Organizations for County Highway Departments" by John J. Cox, County Engineers of Washtenaw County.

"Maintenance of Town Highways; Methods and Organizations," by T. H. Noble, Chairman, Grosse Isle Township Road Commission.

Thursday, Feb. 26, 1:30 p. m.

"Fundamentals of the Construction of Highways and Bridges Required by the Federal Aid Law," by James T. Voshell, District Engineer, Chicago, Ill., United States Bureau of Public Roads.

"Widths and Loadings for Highway Bridges on State Trunk Routes and County and Town Highways," by Lewis M. Gram, Professor of Structural Engineering, University of Michigan.

Thursday, Feb. 26, 6:30 p. m.

Informal dinner of the Michigan Road Commissioners' and Engineers' Association, Michigan Union.

President William P. Rosso, Presiding Officer.

Friday, Feb. 27, 9:00 a. m.

"Latest Improvements in Cement Concrete Pavement Construction," by L. C. Smith, Engineer-Manager, Wayne County Road Commission.

"The Use of Slag in Cement Concrete Pavements," by H. K. Bishop, Chief Engineer, Indiana State Highway Commission.

Friday, Feb. 27, 1:30 p. m.

"Modern Methods of Constructing Brick Pavements," by Edward H. Christ, Civil and Consulting Engineer, Grand Rapids, Mich.

"Types of Roads and Pavements Suitable for Michigan State and County Trunk Highways," by Frank F. Rogers, State Highway Commissioner of Michigan.

Nebraska Road Institute

As announced in a previous issue of "Good Roads," the third meeting of the Nebraska Road Institute will be held at the University, Lincoln, on March 1 to 5, inclusive.

The morning session on Monday, March 1, will be devoted to the registration, and in the evening there will be a smoker at the Commercial Club. On the evening of Tuesday, March 2, the annual meeting of the Nebraska Engineering Society will be held, and the evening of Wednesday, March 3, has been reserved for meetings of road organizations. The annual banquet of the Nebraska Road Institute will be held on Thursday evening. The program of the technical session follows:

Monday Afternoon

Address of Welcome, by Chancellor Samuel Avery, University of Nebraska.

Response by A. Barnett, Dean of Nebraska Road Boosters.

"Federal Aid in Nebraska," by James C. Wonders, District Engineer, U. S. Bureau of Public Roads.

"Administration and Organization of Department of Public Works," by E. H. Morey, Chief, Bureau of Roads.

(Concluded on page 116)

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

Founded January, 1892

E. L. POWERS
Editor

T. A. HULBERT
Managing Editor

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Copy for classified and other advertisements where proofs are not required will be accepted until noon on Monday of the week of issue.

Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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Vol. XVIV FEBRUARY 25, 1920 No. 8

FRENCH HIGHWAYS

In the last issue of last year we took occasion to comment briefly in this column on the widespread but erroneous belief in this country that the roads of France are far superior to those of America. At other times in the past we have called attention to the same matter, always with the hope of doing what we could to make American roads and American road builders better appreciated in their own country. Because we gladly emphasize anything bearing out our contention that the road builders of America are not behind the road builders of other countries—and because, as a description of French roads, it is well worth reading—we recommend the article on "The Roads of France," by Maj. Durham, that is printed on other pages of this issue.

"Good Roads" would be the last to cast doubt upon the excellence of the French roads, individually or as a system, or upon the contributions to the science and art of road building that have been made by French engineers. But it can not agree with careless comparisons that are unfair to the roads of this country.

Many, perhaps the majority, of those who draw erroneous conclusions as to the roads of France do so because their observations were limited to a few of the more popular touring routes, as Maj. Durham suggests. Then they compare these few roads they have traversed in France, not with the roads of corresponding character in this country, but with the average—perhaps even the poorer—country roads in America. The result is what might be expected.

And there is danger of drawing wrong conclusions even if comparisons are made between roads that are truly comparable. The difference in conditions in the two countries must be taken into consideration. For instance: The total road mileages of the two countries should be taken account of; the length of time that has been devoted to the work should be remembered; the density of population is a factor that should not be forgotten; and the amount and character of traffic must be considered.

The consensus of opinion of trained observers seems to be that the French have a most excellent road system—Maj. Durham's belief is that "It is unquestionably true that in all points of general plan and in most items of detail and auxiliary construction, the French road system leaves little room for improvement," and he finds the causes for that condition in three factors: centralized control, free from politics; an adequate original plan that obviates the necessity for extensive and expensive reconstruction; and continuous maintenance.

For the most part, the United States lacks all of these. But, taking everything into consideration, there has not yet been adduced any conclusive evidence that American road builders have lagged behind those of France.

BITUMINOUS MACADAM AND BITUMINOUS CONCRETE

That many do not yet conform to general usage in respect to the terms "bituminous macadam" and "bituminous concrete" was evident from some of the discussion at the recent A. R. B. A. convention at Louisville.

As generally used at present, the term "bituminous macadam" means a wearing surface of broken stone and a bituminous binder which has been applied by the penetration method, while "bituminous concrete" means a similar surface in which the aggregate and binder have been mixed together before being placed on the road. And not only are these terms so used, but the most authoritative definitions give them those meanings.

Road building is a comparatively new branch of engineering and it is natural to expect some differences in nomenclature. But so much attention has been given to defining road building terms and these two particular ones have been discussed so often that there ought to be little confusion in their use.

SNOW REMOVAL FROM ROADS AND STREETS

The paralyzation of traffic in New York City during and following the recent snow storm which beseiged the city cannot fail to stimulate city and county officials to a more careful consideration of the problem of snow removal.

It had been, and continues to be, the policy of some street and highway officials to give but little attention to this important matter. Snow storms occur on few days of the year and officials are prone to forget, during the season when the sun is high in the sky, the effects of snow blockades. But notwithstanding the infrequency of snow storms, the problem of snow removal is important and should not be pigeonholed as a minor matter. It has been estimated that the recent storm cost New York City at least $5,000,000 per day.

In snow removal there are two factors which are essential—skillful organization and the putting of this organization in full operation within a very short time. Sufficient snow removing machinery must be available and a sufficient number of men must be put to work before the important ways of traffic have become impassable. Snow that is allowed to pack and drift requires much more time and labor to remove than does loose snow that has just fallen. The task of snow removal, like other emergency work, becomes lessened in magnitude when met with preparedness.

Nebraska Road Institute

(Continued from page 114)

Tuesday Forenoon

"Construction of State Highways," by A. S. Mirick, Chief Construction Engineer, Nebraska Department of Public Works.

"Maintenance of State Highways," by George E. Johnson, Secretary Nebraska Department of Public Works.

"County Highway Patrol for Maintenance," by A. H. Edgren, County Engineer of Lancaster County, Nebraska.

Tuesday Afternoon

"Evolution of Nebraska's Highways," by Professor Geo. R. Chatburn, University of Nebraska.

"Evolution of a County Bridge," by D. L. Erickson, Deputy County Engineer of Lancaster County, Nebraska.

"Highway-Railway Crossings," by F. T. Darrow, Assistant Chief Engineer, C. B. & Q. R. R.

Wednesday Forenoon

"Nebraska Cement Company," by Louis J. Hoenig, Sales Manager, Nebraska Cement Co.

"Nebraska's Road Material Resources," by Dr. Geo. E. Condra.

"Nebraska Good Roads Association," by Geo. F. Wolz, President.

Wednesday Forenoon

Inspection Trips: (a) Visit to Department of Public Works, State House; (b) Visit to office of County Engineer of Lancaster County, Court House; (c) Visit to Construction Work in Progress on Lancaster County Roads; (d) Visit to completed Lancaster County permanent highways and graded earth roads.

Thursday Forenoon

"The Use of Trucks in Building and Maintaining Roads," by Geo. E. Johnson, Secretary, Nebraska Department of Public Works.

"Motor Operation and Transport Service," by Marcus Potete.

"Motor Transportation in Nebraska," by Loyd Winship, Secretary and Treasurer, Hebb Motor Co.

"Motor Transport Rates," by Thorn Brown, State Railway Commissioner of Nebraska.

Address by Governor S. R. McKelvie.

Thursday Afternoon

"Model Methods in Highway Educational Work," by James W. Brooks Director, Educational Bureau, Federal Highway Council.

"Gravel Roads in Iowa," by Prof. T. R. Agg, Iowa State College.

"Inspection and Testing of Road Materials," by Prof. Clark E. Mickey, University of Nebraska.

Friday Forenoon

"Latest Developments in Concrete," by A. N. Johnson, Consulting Engineer, Portland Cement Association.

"Construction of State Highway Project No. 81 Concrete Road at Fremont," by Clark Brown, Project Engineer, U. S. Bureau of Public Roads.

"Construction and Maintenance of Bituminous Macadam Pavements," by Geo. E. Martin, Barrett Company.

Friday Afternoon

"Brick Paving," by Clark R. Mandigo, Chief Engineer, Western Paving Brick Manufacturers' Association.

"Financing County Paving," by Geo. Wolz, President Nebraska Good Roads Association.

"Highway Program for 1920," by Geo. E. Johnson, Secretary, Nebraska Department of Public Works.

Army Trucks for Road Building

War Department Has Turned Over to Department of Agriculture 24,000 Vehicles and 12,000 of These Have Been Turned Over to the States—Other Plant to be Available

According to a recent announcement by the Department of Agriculture, the War Department has turned over to it approximately 24,000 motor vehicles under the law authorizing the distribution of war materials among the state highway departments for use in highway work. This number, it is stated, is practically all the War Department has to release. Of the total, about 12,000, or 50%, have been delivered to the states, and the remainder will be distributed as soon as railway cars are available for their transportation.

"The state highway commissioners," the statement continues, "are also interested in securing allotments of tractors, steam shovels, locomotive cranes, automotive cranes, industrial railway track, dump cars and industrial locomotives which remain to be disposed of by the War Department. A measure known as the Kahn Bill, directing the Secretary of War to release this material for the state highway commissioners, has passed the Senate and has been reported out of committee in the House. Until the Secretary of War has been directed by Congress to turn over this equipment, it is not likely that it will be available for state distribution."

Road Institute at the University of South Carolina

The first road institute under the auspices of the University of South Carolina, the Citadel Clemson College, and the State Highway Commission of South Carolina, will be held at the University of South Carolina on Wednesday and Thursday March 3 and 4. Besides the sessions on Wednesday and Thursday morning and afternoon for the presentation of papers and discussions, there will be an illustrated lecture by a representative of the U. S. Bureau of Public Roads, followed by a smoker on Wednesday evening. The program of the technical session follows:

Wednesday Forenoon.

Presiding Officer, A. M. Gibbes, President, Gibbes Machinery Co., Columbia, S. C.

Address of welcome, by Dr. W. S. Currell, President, University of South Carolina.

"Purposes of the Institute," by C. C. Hearon, Member, South Carolina State Highway Commission.

"State and County Highways; Their Relations and Functions," by R. Goodwin Rhett, Charleston, S. C.

"Road Surfacing Materials in South Carolina," by Prof. Stephen Taber, Department of Geology, University of South Carolina.

"Bond Issues for County Roads and the Necessity for Adequate System of Maintenance," by W. C. Hamrick, Chairman, Highway Commission of Cherokee County, South Carolina.

"The Obligation of Land Owners as Regards the Construction and Care of Roads," by D. R. Coker, Farmer and Merchant, Darlington, S. C.

"The Duty of the County Road Official to the Country Church and School," by Rev. J. A. Brock, Supervisor State Survey, Inter-Church World Movement.

Wednesday Afternoon

Presiding Officer, S. B. McMaster, Columbia, S. C.

"The Squad System of Road Maintenance," by D. H. Winslow, Engineer, North Carolina State Highway Commission.

"Road Maintenance in Cherokee County," by Geo. C. Stanley, County Engineer of Cherokee County, South Carolina.

"Road Maintenance in Greenville County," by W. H. Willimon, County Supervisor of Greenville County, South Carolina; general discussion led by A. L. Ervin, Supervisor, Florence County.

"Patol System of Road Maintenance," by H. G. Shirley, Secretary, Federal Highway Council; Former State Highway Engineer of Maryland.

Thursday Forenoon

Presiding Officer, Frank E. Broadnax, Columbia, S. C.

"Top-Soil Roads," by P. F. Patton, County Engineer of Spartanburg County, South Carolina; discussion led by L. M. Weisiger, Resident Engineer, South Carolina State Highway Department.

"Drainage Structures and Sub-Drainage," by N. C. Hughes, County Engineer of Laurens County, South Carolina; discussion led by H. C. Orr, Bridge Engineer, South Carolina State Highway Department.

"Road Location," by R. T. Brown, Chief of Surveys, South Carolina State Highway Department; discussion led by W. S. Lewis, County Engineer of Marion County, South Carolina.

"Care of Road Equipment," by H. H. Kester, County Engineer of Lancaster County, South Carolina; discussion led by C. E. Corley, Supervisor, Lexington County, South Carolina.

"Hard-Surfaced Roads," by F. H. Murray, Chief of Construction, South Carolina State Highway Department; discussion led by Jas. W. Martin, County Engineer of Charleston County, South Carolina.

Thursday Afternoon

Presiding Officer, L. L. Hardin, Highway Commissioner of Richland County, South Carolina.

"Relation of the Highway Engineer to Successful Road Location, Construction and Maintenance," by T. F. Hickerson, Professor of Civil Engineering, University of North Carolina; discussion led by Capt. J. Roy Pennell, State Highway Engineer of South Carolina.

"Culverts and Bridges," by J. W. Barnwell, Bridge Engineer, South Carolina State Highway Department; discussion led by Prof. Hickerson.

"Sand-Clay Roads and Their Maintenance," by L. P. McMillan, Supervisor, Bamberg County, South Carolina.

Reports on county road work by county supervisors and County Engineers.

Massachusetts Highway Association

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JOHN M. McCARTHY, Secretary ....15 Ashburton Place, Boston
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FRED B. RICHARDSON .... Brookline

Announcement

This section of the paper is open to members of the Massachusetts Highway Association for the discussion of matters directly connected with road interests. Members are requested to submit items of interest for use in this column.

Address all communications to GOOD ROADS, P. O. Box 2705, Boston.

The annual meeting of the Massachusetts Highway Association was held at the American House on Feb. 12th, with about 125 members and guests present.

The annual election of officers resulted as follows: President, James C. Blake; Vice President, David H. Livingstone; Treasurer, Charles A. Brown, of Wellesley; Secretary, John M. McCarthy, of Natick; Directors, Fred B. Richarsdon, of Brookline, and William P. Hammersley, of Norwood.

The death of William J. Gannon, late President of the Association, was announced. An account of his life and funeral appeared in this column on Jan. 28.

Vice President Macksey presided and the reports of the treasurer and secretary were read and accepted.

The following new active members were elected: Robert P. Marsh, Superintendent, Department of Public Works, Springfield; Wm. H. Woodward, Springfield; David Curtin, Winthrop; G. E. Leadbetter, Leominster.

The principal speaker was the newly appointed chairman of the Massachusetts Department of Public Works, John N. Cole.

Mr. Cole pointed out that he was not a "colonel" but only a "private" and that the many problems that now confronted him would require some time to straighten out, but what appeared to him to be one of the most important matters for consideration and settlement was the reasonable and proper division of the cost of highway improvements between the cities and towns, the counties and the state, so that each would bear its proportionate share of the expenditure.

Another matter that brought up the question of apportionment of costs was that of highway bridges, and he expressed the opinion that there should be some definite procedure established to determine within what limits the state would act in the matter of bridges and definite lines established to determine just where the responsibility of the state begins and the local authorities' ends.

Mr. Cole expressed decided opinions on the matter of snow removal from highways. He believes that before the taxpayers' money is expended in plowing and shoveling out state roads, there should be a thorough investigation as to who will receive the principal benefits from the work and whether the practical results to the community will justify the expenditure.

He cited the case of the Boston-Lawrence trunk line. Certain manufacturers had requested that money be spent in keeping this road open so that their trucks could get through, and it was a question as to whether the spending of several thousand dollars in this particular case would be of sufficient benefit to the general public to warrant it.

The Commissioner said in closing, that he needed the cooperation of the local highway officials and that he thought that they would be glad to have his help in road matters and expressed a wish that his relations with the road men would always be pleasant.

A general discussion of the snow problem followed, Messrs. Rablin, Dunphy, Manning, West, Thayer, Rhodes, Gaffey, Keyes, Worcester and Murphy taking part.

Commissioner Murphy, of Lowell, gave an interesting description of the use of a snow leveller drawn by four horses, which he used to break out the streets, and he invited the members to come to Lowell and see what excellent results he had obtained in this way.

The meeting then adjourned. The Association will probably meet again about March 23.

News and Gossip

The Waltham Chamber of Commerce, with officials of Waltham and Weston, is formulating plans for converting Weston Street, the main thoroughfare from Waltham to Weston, into a state highway. The roadway is a part of the Lincoln Highway from Boston to New York.

The Chamber of Commerce will petition the committee for a hearing on the plans already filed, which request that the road be straightened and rebuilt and maintained by the state.

The bridge commission for Springfield, headed by former Governor John L. Bates, has filed a report recommending the construction of a bridge across the Connecticut River connecting Springfield and West Springfield, at a cost of $3,608,000, construction to begin as soon as the contracts are let.

The other members of the Commission are: Joseph H. O'Neil, a banker; and Joseph R. Worcester, an engineer, both of Boston.

On Feb. 5 the entire force of city laborers and teamsters of Peabody went on strike to enforce their demands for more money. The strike leaves the city without an employee to help remove the snow.

When the city budget was made up recently, it allowed the laborers and teamsters $4.25 a day. The men immediately presented demands for $4.50. A compromise of $4.40, offered by Mayor Donnell, was finally accepted.

Taxation of billboards is recommended to the Legislature in a report by a special commission consisting of Henry A. Wyman, former Attorney General; former Chairman of the Highway Commissioner William D. Sohier, and former Chief of the District Police John H. Plunkett.

All billboards and signs, except those which, in conformity with the law, call attention to the person whose business or profession is performed on the premises, would be taxed an amount determined by the Division of Highways of the Department of Public Works after the location of such sign or device, the character of the neighborhood, the number and class of persons usually passing within sight of the sign and other factors had been considered in fixing the value of the sign for advertising purposes.

The commission recommends also that the owner or user of a sign shall be liable for all damages in any highway accident of which the sign is the approximate cause, and every public officer is given authority to destroy any signs that do not comply with the law.

Every superintendent of streets who has anything to do with trees along the highways, should be sure and secure a copy of Bulletin No. 816, issued by the U. S. Department of Agriculture at Washington.

The title of this pamphlet is "Street Trees," and it covers the subject very completely.

Henry V. Macksey, Vice President of the Massachusetts Highway Association and Superintendent of the Public Works Department of Woburn, has tendered to Mayor Bernard J. Golden his resignation. It has been accepted.

Supt. Macksey was appointed head of the Public Works Department in 1915 by Mayor Harold P. Johnson.

The City of Lawrence faces a strike of the employees of its Street and Health Departments unless the demands of the men for an increase in wages from $4.00 to $5.00 per day are granted.

The demand was filed last December, but was referred to this year's government, and Mayor White asked the men to wait until Feb. 10, when he would announce his position on the question. The men say they will refuse to wait any longer than Tuesday, and furthermore, that they want all they ask for, although Mayor White has unofficially stated that $4.50 per day was the limit which he would favor, as that is the highest amount paid any city laborers in the state.

Edward A. Riley, for 25 years connected with the Public Works Department of the City of Melrose, Water Division, died recently at his home, aged 35 years.

He started working after school hours when 10 years old, his father, the late James W. Riley, at that time being superintendent of the Water Department. Young Riley grew up in the department and was inspector for many years. He was unmarried. He leaves a mother and two sisters.

As part of the plan to provide additional revenue for the City of Boston by increasing the price of various fees and licenses, Mayor Peters has established a fee of $1.00 for each special permit and $10.00 for each annual permit issued under the new state law governing the length and width of motor trucks. Before the enactment of this law last year, the charge was 50 ct. for special permits and $1.00 for annual permits. The law provides that "no commercial motor vehicle, motor truck or motor-driven vehicle shall be operated on any way in this commonwealth, the outside width of which is more than 96 in. or the extreme over-all length of which exceeds 28 ft., except that such a vehicle exceeding 26 ft. may be operated when a special permit is secured."

Cambridge expended $10,000 to make its streets passable after the recent storm, it has been announced.

Superintendent of Streets Dunphy announced that, with the exception of the car line thoroughfares where the plows of the Elevated had banked up the snow, all the streets of the city were fairly free. The 100 pungs owned by the Elevated for use in Cambridge, it was found when the storm got under way, had shrunk because of age and lack of use, to 40. In addition, Elevated officials were not able to secure horses to utilize this limited pung equipment. Superintendent Dunphy, however, used the pungs to good effect in breaking out thoroughfares by supplying city horses and employees.

Representative Hays appeared before the Legislative Committee on Roads and Bridges asking that a part of the money paid for the registration of automobiles by the people of Boston be returned to the city for the purpose of constructing main thoroughfares.

Representative Hays said the amount paid for the registration of motor vehicles owned in Boston, is at least $1,000,000 a year, but that Boston gets no benefit from it, because all of the money is expended on state highways, of which Boston has none.

John N. Cole, Commissioner of Public Works, asked the committee for two weeks' time to prepare figures which will show the facts about the receipts from registration fees, and this was granted.

In direct opposition to the Finance Commission's recommendations, Mayor Peters, of Boston, has approved several contracts for the removal of refuse and offal at an estimated cost more than $45,000 greater than last year. The new contracts are similar to those of last year in that they require the city to pay the contractors according to the number of cubic yards collected, a feature of the contracts to which the Finance Commission made serious objection.

This new system was adopted by the Public Works Department a year ago against the Finance Commission's advice. According to a recent report of the commission, the city in the past year paid $45,000 more than in the previous year for the collections, without any attending improvement in the promptness or efficiency of the collections. The new contracts for the year ending Jan. 31, 1921, were awarded after bids had been received from various contractors.

The lowest bids in four of the five districts from which contractors collect ashes and other refuse were considerably higher than last year's prices. A striking example of these increases is in the Brighton district. Here the city paid 60 ct. a cubic yard last year for the collection of 60,000 cu. yd. This year it will pay $1 a cu. yd.

In detail, the contracts for the ash collections were awarded as follows for the ensuing year: East Boston, 60 ct. a cubic yard, to the East Boston Contracting Co., compared with 38.5 ct. last year; Brighton $1 a cubic yard, to McMurtry Brothers, compared with 60 ct. last year; West Roxbury, 55 ct. a cubic yard, to John J. Moore, compared with 40 ct. last year; Dorchester, 62.5 ct. a cubic yard, to William J. Hunt, compared with 58 ct. a cubic yard last year; and Hyde Park 33 ct. a cubic yard, to M. McGinnis & Co., compared with 46 ct. a year ago.

The contracts awarded for the removal of offal were as follows: Brighton 39 ct. a cubic yard, to Walter Griffin; West Roxbury, $1.70 a cubic yard, to M. H. Loonie; Dorchester $1.74 a cubic yard, to Thos. H. Gorman & Co., and Hyde Park, $1.11 a cubic yard, to George R. Tate.

John N. Cole, Commissioner of the State Department of Public Works, has sent to the Governor and Council the name of Frank A. Goodwin, formerly Street Commissioner of Boston, for appointment to the position of registrar of motor vehicles. By the law under which the old Waterways and Highway Commissions were consolidated, the office of registrar of motor vehicles was created, the appointment to be made by the commissioner of the department.

The registrar will have full charge of the registration of motor vehicles and the licensing of operators, will administer the law covering infractions of the motor vehicle law, try cases of accused operators and also have direction of the investigation of accident cases and the campaign of the department that has lately been started to prevent car stealing.

Mr. Goodwin was appointed street commissioner by Mayor Curley in April, 1914, to succeed James A. Gallivan, who had been elected to Congress. He served in that office until March, 1918, when he was removed by Mayor Peters. In a statement issued in connection with the announcement of Mr. Goodwin's appointment Commissioner Cole says:

"Mr. Goodwin is a well known attorney with residence in Orient Heights, East Boston. He is married, and has two sons, one of whom volunteered at the age of 18 in the Regular Army and served in France with the 29th Engineers.

"Mr. Goodwin was educated in the Boston public schools, is a graduate of the Boston University Law School, a member of the Suffolk bar, and has an office at 17 Milk St. He was a member of the Boston City Council in 1908-09, and served as street commissioner for Boston from 1914 to 1918, giving especial attention in his work as street commissioner to the question of securing relief for traffic congestion.

"In this work Mr. Goodwin was the original proponent of the plan to take from Boston Common the area which was approved this year as a relief to the traffic conditions on Tremont St. He was the principal supporter, in cooperation with Louis K. Liggett, when that gentleman was president of the Boston Chamber of Commerce, of the plan to remove electric cars from Washington St. between Franklin and Essex Sts., resulting in making that a one-way street for vehicular traffic.

"Mr. Goodwin's experience as street commissioner, in which there was much of a semi-judical character in connection with hearings, permits, licenses, and other means of controlling street conditions in Boston, is expected to be most helpful to him in administering the duties that will come to him as registrar of the Motor Vehicle Department of the Commonwealth. The appointment is to take effect on March 1 next."

Lowell has spent about $45,000 on the big storm; Worcester $50,000; Taunton was spending at the rate of $1,000 per day when the citizens called a halt and decided to economize. Malden has spent $9,000, and so it goes throughout the state. More additions to the H. C. of L. for the poor oppressed taxpayer.

The laborers in the Public Works Department of Malden, through Local Union 316, have called on Mayor Kimball for a raise of $1 per day in wages. The men have been receiving $4.00 per day for seven months and the matter of increase will be referred to the Board of Aldermen at the next meeting.

New Hampshire Goods Roads Association

OFFICERS FOR 1919

FREDERIC E. EVERETT, President	Concord
WINFIELD M. CHAPIN, First Vice President	Keene
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W. B. HOWE, Secretary and Treasurer	Concord

Board of Directors

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Commissioner Everett of the New Hampshire State Highway Department has been authorized by the Governor and Council to put into operation the new plan for cooperative maintenance of country roads, and the towns interested have been notified to arrange for appropriations to carry out the new arrangement.

The towns are asked to provide approximately $66 per mile for the initial improvement and then the state will assume the expense of maintenance.

About 300 mi. of dirt road are involved and the towns are required to expend a total of about $21,000.

Fifteen sections are involved, made up as follows: (1) Whittier road, from Meredith to West Ossipee; (2) Central Road, from Claremont through Concord to Dover and Rochester; (3) Sunapee Lake Road, from the Central Road in Sunapee through New London, Bristol and Hebron to the Moosilaukee Road in Plymouth; (4) Moosilaukee Road, from the Merrimack Valley Road in Plymouth through Rumney, Warren, Benton and Pike to the West Side Road in Haverhill; (5) Mascoma Valley Road, from the Merrimack Valley Road, through Andover, Canaan and Enfield to the West Side Road in Lebanon; (6) Winnipesaukee Road, from the Merrimack Valley Road in Lakeport through Alton and Farmington to the East Side Road in Rochester; (7) Contoocook Valley Road from the Massachusetts state line in Rindge through East Jaffery, Peterborough, Hancock, Antrim, Hillsborough and Henniker to the Central Road in Hopkinton; (8) Suncook Valley Road, from the East Side Road in Ossipee through Wolfeboro, Alton, Barnstead, and Epsom to the Merrimack Valley Road at Suncook; (9) Monadnock Road, from the South Side Road in Keene through Troy and Fitzwilliam to the Massachusetts state line; (10) Hudson-Derry Road, from the Merrimack River in Hudson, opposite Nashua, through Londonderry to Derry Village; (11) Raymond-Plaistow Road, from the South Side Road in Raymond through Kingston and East Kingston to the Massachusetts state line in Plaistow; (12) Baboosic Road, from Manchester through the towns of Bedford and Amherst to the junction of the South Side Road in the town of Milford; (13) New Hampshire College Road, from the East Side Road in Dover through Madbury, Durham, Newmarket, Newfields to the junction of the South Side Road in the town of Exeter; (14) Cheshire Road, from Keene through the town of Roxbury, Nelson to the junction of the Contoocook Valley Road in the town of Antrim; (15) South Side Road, from the Vermont state line near Bellows Falls, Vt., through Alstead and Acworth to the West Side Road south to Keene, then through Dublin, Peterborough, Wilton and Milford to the Merrimack Valley Road in Nashua.

Although the state is empowered to construct trunk line highways where there exist only unimproved roads, it is not authorized to maintain unimproved sections, and as this detail has now been provided for by the Governor and Council, the commissioner will be able to keep in condition many roads that have heretofore not come under the supervision and maintenance of his department.

The new federal aid bill now being considered by Congress will give New Hampshire an extra allotment of some $600,000, in addition to the $434,000 that is now available.

The "Manchester Leader" prints a special article giving an interview with Commissioner Everett, from which the following is an extract:

"Highway building in the State of New Hampshire during the season of 1919 started off with the greatest financial impetus that we had ever experienced. This was due in large measure to the extra appropriation for federal aid. Besides our regular state appropriation, the Government allowed us $642,000 for federal aid construction. Although a large amount of work was actually accomplished it does not begin to approach the program which had been mapped out at the beginning of the season. This failure to carry out the program was caused by the acute labor shortage experienced early in the season and continuing throughout the summer and fall months.

"We are now under contract with the U. S. Government to build 102 mi. of federal aid road and 87 mi. of this 102 mi. of construction is already begun and approximately 60% of the 87 mi. is completed. During the entire season of 1919 there were 115 mi. of new roads constructed. This includes federal aid, state aid construction and trunk line construction. Our trunk line system now comprises approximately 1,500 mi. of improved road. This, of course, is increasing yearly as new mileage is added and it is evident that maintenance money must also increase, due to new mileage of improved road. The cost of such maintenance has increased approximately 50% in the last three years, due to labor conditions and high cost of materials. The automobile revenue is increasing yearly but not in the same proportional rate as the increased cost of maintenance. It is, therefore, evident that unless the revenue derived from automobiles is increased, either by an increase of the license fee generally or by a pro-rata fee for trucks, according to their weight, it will be necessary that an appropriation be made by the Legislature to take care of road already constructed.

"During the session of 1920 there will be available for new construction appropriations for federal aid, trunk line aid and state aid, including both the town and state's share. The estimated cost of maintenance for the season of 1920 is $1,017,033.12. This covers maintenance of all state roads in the state.

"The Highway Department is expecting to submit to the Government 75 mi more for its approval on federal aid work. During the coming season the federal apportionment is $234,000. The labor situation has not changed materially, although we have hopes of completing all our federal aid work. It will be necessary to utilize machinery to replace hand labor wherever it is possible.

"Several large federal aid projects were started during the season of 1919, which, when completed, will be of great benefit to the traveling public. The Lafayette Road in the towns of Portsmouth, Rye and North Hampton will make a connecting link between the Massachusetts state highway and the Maine state highway, which will be the most direct and will eliminate the necessity of going along the shore road. This road will be continued this year in the town of Newington, thereby improving a section which has been in poor repair for several years. Especial efforts are to be made this coming season in constructing the central trunk line from Claremont through Concord to Dover and Rochester. Large expenditures of money are contemplated in the towns of Newport, Sunapee, Lebanon, Hooksett and Merrimack. The work in Candia on the South Side Trunk Line is to be continued, the idea being eventually to resurface the whole of the South Side Trunk Line in this town.

"Three other roads which are of a good deal of interest to the public are receiving large proportions of federal money. The Whittier Road from Meredith to Lebanon and the Monadnock Road from Keene towards Fitchburg, Mass., are to receive large allotments of federal money. A new departure for the Highway Department is the maintenance of the unimproved sections of trunk line highway. It has been noted as soon as a trunk line is laid out and before any construction has begun, the town feels that its liability has ceased. To any inquiry as to the reason for not maintaining a piece of town road which is located on a state highway, the town invariably says it would be a waste of money in so far as the state is soon to construct the road. The result is usually deplorable condition until such construction is actually accomplished.

"This year the state is offering the towns in which such highways are located a proposition to take over the maintenance of these sections, provided the town will set aside a stipulated amount of money for this purpose, the state to stand any expense above the amount asked for from the town. While this does not mean that the unimproved sections of highway will be in as good condition as the improved sections, it will insure a passable road."

Franklin suffered with the rest of New Hampshire on account of the storm, and the work of breaking out the roads was especially difficult on account of the crust which formed that resulted in serious injuries to the horses, nearly every animal returning to the stables with legs gashed from the thin ice that covered the snow.

Agitation for a west side bridge for Manchester has been renewed on account of a recent distressing accident in which three members of one family were drowned while attempting to cross the river in a boat.

The general feeling is that if the town is to develop as it should, two new bridges should be provided, one on the west side and the Amoskeag Bridge.

The snowstorm that started on Feb. 4, buried New Hampshire and most of the rest of New England.

This was the fifteenth snow fall of the winter and the total precipitation for December and January was 26½ in.

Electric car lines were completely tied up and the steam roads were also put out of business and many regular trains were discontinued.

At the annual town meeting, Sunapee will be asked to raise $5,000 to meet the state appropriation for the trunk line road through the south part of the town and $13,333 to meet the state appropriation of double the amount for the completion of the Sunapee Lake Road. It is a safe bet that the town will vote to bond itself for $18,000, and the completion of these roads will be only a matter of time.

The mix-up in Manchester caused by the sickness of Mayor Moise Verrette has reached a stage that is beyond the comprehension of the ordinary citizen.

The Mayor was taken sick and confined to the house; during his absence the aldermen voted to elect Alderman Barry as acting mayor. Mayor Verette, not wishing to see his authority taken over by another, promptly arose from his sickbed and appeared at the City Hall to attend to his duties and so for a time at least, Manchester is provided with a mayor and an acting mayor.

In most sections of the state the conditions for sleighing are ideal, but the horses and sleighs of former days are missing.

Probably Henry Ford had a good part in the disappearance of the pleasure sleighing.

An innovation in the municipal affairs of the city was the public meeting held recently in the Council Chamber at the Concord City Hall under the auspices of the Concord Citizenship Committee. There was a large attendance of both men and women.

The United States Weather Bureau has arranged to issue bulletins showing the road conditions in any part of New England.

This system of road information was first used by our troops overseas in connection with the movements of motor convoys.

By the use of the reports issued by the New England highway weather bulletins, a person contemplating a trip by road to any part of New England may learn what lies ahead. A motor truckman with a contract to move a load from Boston to Bangor can learn whether there is much or little snow on the Maine roads, if they are mud-rutted as a result of rain, or in condition for a quick haul; and if weather changes are likely to help or hinder the trip. Similarly, a motor tourist contemplating a trip through the White Mountains, instead of starting off in the unknown, will known in advance whether rain or snow has imposed, or is likely to impose, burdens on travel, may postpone the trip or so shape it as to avoid sections in which conditions are shown to be unfavorable.

All main routes of highway traffic from Maine to Rhode Island are covered in the detailed summary of prevailing conditions.

The amount of snow in the several sections is indicated by a map, with varied shadings arranged to show whether the snow blanket is less than 3 in., between 3 and 6 in., or over 6 in. deep. In the spring the presence of frost and mud will be indicated; in summer conditions of rain and road repairs.

Observers are posted at 200 places throughout New England from which they send in weekly reports covering conditions of weather and information as to roads that are impassable.

George P. Winn, City Engineer of Nashua, has been confined to a hospital at Melrose, Mass., for the past two weeks. The latest report, however, is very favorable, and we expect Mr. Winn will soon return to Nashua.

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Crusher Run

John H. Gordon, President of the New York State Road Builders' Association, presided at the annual meeting which was held at the rooms of the Association, 25 North Pearl St., Albany, on Thursday, Jan. 29, at 3:00 p. m. Business matters, financial and otherwise, and many other subjects touching on road work for the year were discussed. The members were in attendance in large numbers.

In the evening a banquet was tendered by the members of the Association to all road contractors engaged in work in New York State. The banquet took place at the Hampton Hotel. More than 125 road contractors were present. Commissioner Frederick Stuart Greene addressed the guests, and outlined the program to be carried out on state highways this year. The Commissioner asserted that much work was contemplated in every part of the state. The highways of New York State, compared with highways throughout the country, are better, according to Commissioner Greene and this he attributes in large measure to cooperation given road building by the road builders of the state, the New York State Road Builders' Association being an important factor in bringing about this cooperation.

Mayor Lunn, of Schenectady, N. Y., one of the speakers at the banquet, mentioned the fact that not always is the fault of poor roads at the door of the contractor; that a road contractor takes just as much pride in his work as is taken by members of other crafts; that a contractor is just as anxious to see his clients pleased as they are to be pleased.

The other speakers at the dinner were Former Commissioner John N. Carlisle; Benjamin P. Wheat, of the law firm of Brackett, Todd, Wheat & Wait, Saratoga Springs; Arthur E. Rose, Warren Thayer, Benjamin McClung, John H. Gordon, Fred E. Ellis, Paul Schultze, I. V. Huie, and S. B. Van Wagenen.

On Friday morning, Jan. 30, a meeting of the executive committee was held, Messrs. John H. Gordon, Thos. H. Gill, Wm. A. Greenfield and Fred E. Ellis being present.

The following road contractors have been elected members of the New York State Road Builders' Association: Roy J. Garafano, Mount Vernon, N. Y.; W. L. Lawton, Glens Falls, N. Y.; Floyd H. Wells, Savannah, N. Y.; David Schoentag, Saugerties, N. Y.; A. C. Steenberg, West Hartford, Conn.; Robert W. Smith, New York, N. Y.; Claire D. Schlemmer, Islip, N. Y.; F. E. Spoor, Philadelphia, Pa.; E. M. Underhill & Son, Glen Cove, N. Y.; Robert Wemple, Fultonville, N. Y.

The following have been elected associate members, with all the privileges of the association with the exception of that of voting: Brockway Motor Truck Co., Utica, N. Y.; H. B. Brewster, Syracuse, N. Y.; C. V. Collins, Troy, N. Y.; Edw. Denniston, Utica, N. Y.; Lehigh Portland Cement Co., (John P. Dolan); Good Roads Machinery Co., (G. K. Smith, Albany, N. Y.); R. E. Brooks, New York, N. Y.; T. A. Dumont, New York, N. Y.; Alsen Cement Co., Highland, N. Y.; (Geo. Hudson); James C. Miller, Syracuse, N. Y.; Thew Automatic Shovel Co., New York, N. Y., and Wilcox Bros., Binghamton, N. Y.

This is the month of conventions, and it is pleasing to note that not a few of the conventions which took place during the month of January were meetings of the associations of contractors. At last contractors seem to be waking up to the fact that a great deal of importance must be attached to organization. One man alone accomplishes very little in the way of securing fair treatment, but let that man have back of him a strong body of men, united for the purpose of securing justice and fair play, and the good he is seeking will be reached and his battle will be fought well and successfully

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Out of the 21 roads which were advertised for bids at the New York State highway letting on Jan. 30, eleven contracts were awarded, one bid was rejected, and no bids were received on 9 roads.

The changes which have been made in the New York State highway specifications will be found to be great improvements, favorable to the contractor, and more easily complied with. One change which the contractor will gladly welcome is that the word "imported" is omitted under the heading of "Material—Local and Imported." The contractor is not bound by the word "imported." If suitable material is found near the locality in which he is working it will be accepted.

The following awards were made at a letting at the New York State Highway Department on Jan. 30, 1920; Spoor-Lasher Co., Inc., Orange County, $40,238.40; Schunnemunk Construction Co., Orange County, $65,839.50; David Schoentag, Ulster County, $46,961.90; John W. Flynn, Warren County, $109,658.90; Arthur F. McConville, St. Lawrence County, $95,829.20; Pathfinder Construction Co., Oswego County, $104,837.50; G. Clayton Hill, Oswego County, $16,497.50; Greenfield Construction Co., Tioga County, $97,416.35; Greenfield Construction Co., Yates County, $138,518.35; Felton Construction Corp., Erie County, $128,808.00; Public Service Contracting Co., Niagara County, $80,476.40.

Commissioner Greene spoke on state road construction before the New York Chamber of Commerce, and declared that unless the state adopts at once a policy of permanent construction it will not be able to meet maintenance charges on its roads.

Assemblyman Dobson has introduced a bill in the Assembly, carrying with it an appropriation of $25,000, in which provision is made for surveys for the proposed route of the Roosevelt Highway, from Montauk Point through the state to Buffalo.

Albany County will get $26,665 of the $2,212,000 to be appropriated in the annual appropriation bill for the improvement of town highways. The appropriation is an annual obligation of the state, set aside by law to meet the appropriation of counties for the construction and repair of town highways. The fund is allotted to counties on a sliding scale, the counties with the highest valuation getting 50% of the amount they set aside, and the counties with the lowest assessed valuation being awarded the same amounts they appropriate.

Jos. W. Manion, former Secretary of the New York State Road Builders' Association, who for the past eight months has been looking after the advertising for the Rathbone, Sard Co., at its plant at Aurora, Ill., has returned to Albany where he will be permanently located with the same firm.

Another letting is scheduled to take place at the New York State Highway Department, the second week in March.

MEETINGS

Calendar of Coming Meetings

Feb. 26-28—Southern Appalachian Good Roads Association.—Tenth Annual Meeting, Asheville, N. C. President, A. D. Williams, Parkersburg, W. Va.

Apr. 12-17—United States Good Roads Association—Eighth Annual Convention, Hot Springs, Ark. Director General, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

Apr. 16-17—Bankhead National Highway Association—Fourth Annual Convention, Hot Springs, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

Associated General Contractors of America

The annual meeting of the Associated General Contractors of America was held Feb. 18 and 19, in the Hotel Morrison, Chicago, Ill. William Hale Thompson, Mayor of Chicago, gave the welcoming address on the morning of the first day. This was followed by reports of the various committees and in the afternoon several papers were presented. In the evening a smoker and entertainment was given.

On Thursday, Feb. 19, the annual reports were presented and discussed in the morning and in the afternoon three sectional meetings were held, the Public Works and Railroad Contractors' Division meeting in room 5, the Building Contractors' Division meeting in room 7 and the Highway Constructors' Division meeting in room 6 on floor B. At the latter meeting, R. G. Collins, Jr., was chairman. A paper on "The 1920 Highway Program" was presented by Thomas H. MacDonald, Chief of the Bureau of Public Roads, U. S. Dept. Agriculture, and the report of the joint conference with the American Association of State Highway Officials was presented, followed by a discussion of the work of the division for the coming year.

The annual dinner was held on Thursday at 6:30 p. m., with D. A. Garber as toastmaster.

The second convention of the National Public Works Association was held Jan. 13 and 14, in Washington, D. C., with 95 delegates in attendance.

The annual meeting of the Engineers' Club of Minneapolis, Minn., was held Jan. 19, at the Andrews hotel in that city. The subject under discussion was city planning.

The twenty-fifth annual meeting of the Minnesota Surveyors' and Engineers' Society was held on Feb. 19, 20 and 21, in the West Hotel, Minneapolis. Sectional meetings were held on various engineering questions and the annual banquet was held on Friday evening, Feb. 20.

PERSONAL MENTION

Frank Mitchell, formerly County Engineer of Thomas County, Georgia, has been appointed by the State Highway Commission as engineer in charge of paving work in the Second District.

Frank T. Townsend, formerly Associate Editor of "Engineering News-Record," is now head of the department of civil engineering, Extension Division, United Y. M. C. A. Schools, New York City.

E. W. Canning, formerly with J. H. Grozier Co., and John B. Leary, formerly with Ford, Buck & Sheldon, Inc., have formed a partnership under the name of Canning & Leary, with offices at Bristol, Conn.

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

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THE HIGHWAY CONTRACTOR AND ROAD BUILDER

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NEW YORK, MARCH 3, 1920

Number
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Factors Which Will Limit Highway Construction During the Coming Season

Materials: Increasing the Output of Existing Plants

By LIEUT. COL. O. P. CHAMBERLAIN

Vice President and General Manager, Dolese & Shepherd Co., Chicago, Ill.

When your President, Mr. G. P. Coleman, requested me last December to prepare a paper on increasing the output of existing plants in the production of road building materials, the labor situation was less troublesome than it appears to be in its present state of development. Were there plenty of laborers who were willing to work, doing a reasonable day's work for a fair day's pay, the problem of increasing the outputs of existing gravel and stone plants, to which the writer will confine himself in this paper, would be comparatively simple.

We are undergoing the readjustment following the World's War. We are attempting to readjust our business to meet the changed conditions that confront us compared with those of the summer of 1917. We are attempting to resume the great program for better highways which had been years in preparation and only fairly commenced in performance when the war interrupted and for three seasons practically stopped the carrying out of our projects.

Labor seems to be war-weary and inefficient. The inflated wage scale and high prices of the war period seem to be augmented since the close of the war, and in resuming our pre-war program we are confronted with conditions new to this generation—unrest, inefficiency and unreasonable wage demands on the part of labor; perhaps undue pressure and impatience on the part of legislatures and other governing bodies in attempting to make up for the three non-productive seasons in highway construction for which the war was responsible.

In confronting our problem as producers of crushed stone, sand and gravel, we realize that our task is both difficult and immediate. It would seem that the first general principle to be adopted is the substitution of machinery for manual labor, wherever possible. Years ago laborers and mechanics inveighed against the use of machinery. The writer distinctly remembers in his young manhood, when working on the farm, hearing the farm hands inveigh against the introduction of harvesting machinery, their grievance being that "machinery was taking bread out of the working man's mouths." These men, or probably their offspring, are probably engaged in watching the wheels of some machine or other go round with nothing harder to do than to stop the wheels turning or to report to a superior any irregularities in the working of the machine, and for that service they are receiving a wage undreamed of by their fathers and living on a scale that to their ancestors would have seemed the height of luxury. Today the working man can, if he desires, participate in practically all wholesome amusements and have all the educational advantages possessed by his employer, living the comfortable, peaceful, honorable life of a citien of this great republic.

The writer will briefly discuss the various processes of quarry operation, giving what he believes to be the most efficient methods of handling the various classes of work in the preparation of crushed rock. It will be borne in mind that much of this discussion will apply equally well to the handling of sand and gravel plts.

Stripping or Removing the Oven-burden

The oldest method of removing the over-burden was that of ploughing up the top soils and sub soils, shoveling it into wagons or carts and hauling it far enough from the theater of operations so that it would not be necessary to again remove it. This was followed by the use of slip scrapers and wheelers and this again by the steam shovel and locomotive crane, small dump cars and a short line railroad with a "dinky" locomotive removing the strippings from the quarry or gravel pit site to the dump. At times the expense can be materially cut by furnishing filling for some railroad embankment or manufacturing site.

The machine that, however, is most useful, most economical and most adaptable for stripping where the over-burden runs from 2 to 10 ft. in depth is the drag line bucket machine capable of turning through an entire circle. It is faster than the steam shovel and, being built with booms varying from 60 to 125 ft. in length, the larger sizes particularly do not have to move very often and can be successfully operated with an engineer, a fireman and four pit-men.

In many quarries and pits it is possible to remove the over-burden for the new workings and deposit it in the abandoned workings of the quarry or gravel pit in a single operation of the drag line bucket. The ability of the revolving drag line to turn through the entire circumference of a circle and in the hands of a skillful operator to dump "on

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*Paper presented at the 17th annual convention of the American Road Builders' Association, Louisville, Ky., Feb. 9-13, 1920.

the run," stopping only to dig, makes it the fastest and most economical stripper thus far produced. A product of the present generation, now improved so that it digs as efficiently as a steam shovel with the advantages above described, the drag line is in the opinion of the writer the stripping machine par excellence.

Stripping should, when practicable be done in the winter and early spring before the busy operating season opens, sufficient for the season's work. The engineer, firemen and pit-men can be transferred to a steam shovel when the operating season opens.

Drilling and Blasting

The writer knows of no more economical method of drilling for blasting than the use of the well drill. In the plant operated by him near Chicago, 5-in. holes are drilled for a 40-ft. depth. Here too, in order to keep the organization together and employ labor to the best advantage, the drilling can be done to a great extent between seasons, following the stripping. When the busy season is at its height the drillers can be dispensed with and employed in other duties in the quarry. The writer has this winter looked with feelings akin to envy on a neighboring quarry which has sufficient rock stripped for a season's operation and a large portion of the drilling ready for the dynamite. In discussing blasting, the writer feels that he is infringing on the prerogative of Tom, Joe or Jerry who is the "powder boss." Was there ever one of these individuals who did not try to impress the superintendent with the idea that there was something mysterious and secret about his process that he would divulge to no one! As a matter of fact, the "powder boss" is frequently wasteful of dynamite and he is a stiff-necked and almost unteachable individual. The writer some ten years ago experimented with sealing the large drill holes above the dynamite charge with a mixture of stucco (quick setting cement, containing plaster of Paris) and screenings instead of tamping with screenings or sand only. So far as he knows the process is original with him. Try it on a few holes and see if you cannot cut down your dynamite charge per hole 25% and shake up your rock just as well as you did formerly. It won't cost much to try it and it may save you some money. Don't try to convert the "blasting boss"; just stand over him and force him to make the experiment.

Many acrimonious discussions have arisen as to whether it is better practice to drill two or more lines of holes back from the face for a single large blast than to blast out a single line of drill holes for a new face. The writer realizes that he is in a minority in advocating the latter method. Theoretically he fails to see what is gained by setting one blast against the other, which is done when more than a single line of holes are exploded at once, unless that the rock is so hard as to require this treatment to break it fine enough to load. In the Niagara limestone where most of his work has been done, the writer has tried both methods and has convinced himself that making a blast with more than a single row of holes, which in his particular work with a 40-ft. face and 5-in. diameter holes he drills 10 ft. apart and 10 to 12 ft. back from the face, is a waste of dynamite and a squandering of money.

Loading

Loading in small plants and up to about 15 years ago in all crushed rock plants was done by hand.

In England and on the Continent of Europe hand-loading is the accepted method

In this country the greatest increase in output, the greatest economy in the employment of labor and the greatest decrease in the cost of production can be secured by substituting loading by steam shovel for loading by manual labor, which involves somewhat extensive alterations in plant and equipment which will be discussed later. Some idea of the saving in the substitution of the steam shovel for hand labor in loading can be gained from the following data. A steam shovel operating at a cost of $55 per day of 10 hours and producing but 1,000 tons per day loads at a quarry cost of 7.8 ct. per ton against 20 ct. per ton for hand loading. These figures include a depreciation and maintenance charge on the shovel of $7,000 per year and are conservative as, in the writers own operation, the steam shovel performances, averaged over long periods, are 1,780 tons per day of 10 hours. Such operation means a loading cost of but 4.4 ct. per ton of stone loaded. Using the conservative figures of a saving of 7.8 ct. per ton in a one-shovel plant which should produce 400,000 tons per year, the annual saving in the substitution of steam shovel loading for hand loading is $58,800.

In the installation of a steam shovel plant the size of the shovel should be carefully considered. In general it is well to let the initial crusher rather than the steam shovel be the limiting capacity of the plant. While you may handle present production with a 60 or 70-ton shovel, you can handle it much more comfortably with a 110-ton shovel and you are in a position to increase your output materially without a new installation. This installation of a small, light shovel is a common mistake made in converting hand loading plants into shovel loading plants. The error is invariably corrected after a few years of steam shovel operation. It is well, however, to remember that while a heavy shovel means a large initial cost, this shovel, working considerably below its maximum capacity, is not apt to be delayed by vexatious breakdowns and its maintenance and depreciation are much less than that of a light shovel that is continuously crowded to its maximum.

Motive Power and Quarry Cars

The substitution of steam shovel loading for hand loading must generally include the installation of new quarry cars and motive power. Most of the hand loading plants used men or mules or horses as the motive power for bringing the loaded cars to the foot of an incline and the cars were handled up a steep incline to the initial crusher by a steam or electric hoist. In a shovel loading plant a small locomotive generally replaces the man or mule motive power in the level quarry bottom. It is difficult to load stone with a steam shovel into cars of less than 6 cu. yd. (7.5 tons) capacity and a car capable of handling 12 cu. yd. (15 tons) is preferable to the smaller size. In designing your car, remember, that you are building for the roughest, heaviest duty known. It takes a strongly built car to successfully withstand the impact of 4 tons of rock dropped 3 ft. to the car floor. Of course, the steam shovel engineer and craneman are not supposed to drop the rock three or even a single foot but they sometimes do so, with disastrous effect on light euipment. In the writer's own experience he has practically rebuilt the 15-ton cars. They had, originally axles standard for a 30-ton railroad car. Axles were broken almost daily. Now, with the standard axle for a 50-ton car they are giving good service. The original steel under-frames have been replaced with heavier structural work; the pedestal castings carrying the journal boxes have been re-designed and built of cast steel instead of gray iron; the car floors which were originally of 3-in. oak plank are now of 6-in. oak timbers carpeted with steel T-irons with the stems of the T's let in between the oak floor timbers. This experience in learning how to build a really serviceable quarry car has been expensive, but it has also been conclusive. The writer congratulates himself that he was not responible for the original design of these cars, with the full consciousness that he would undoubtedly have made the same errors that were perpetrated by the designer. Steam shovel loading was an innovation when these cars were designed. Surely a mechanical engineer should hardly be censured for assuming that a 3-in. thick oak floor would be adequate for a small car and that a master car builders' standard axle for a 30-ton railroad car would be of more than ample strength for a 15-ton quarry car. He simply failed to appreciate the perversely ingenious, diabolical destructiveness of the careless craneman.

The Crushing Plant

All that has been said in regard to the changing of a hand loading plant to a steam shovel loading plant assumes a modification of the crushing plant. Most of the hand loading plants with which the writer has been acquainted contained as an initial crusher a No. 7½, 8 or 9 gyratory crusher. Fifteen years ago, a No. 9 plant was a monster in the Chicago Niagara limestone district. Today many of the 7½, 8 or 9 crusher plants have been converted into steam shovel loading plants by interposing a No. 12 gyratory or some other type of giant crusher between the quarry and the former initial crusher and adding one or more auxiliary re-crushing machines in addition to augmenting the screen capacity of the plants to take care of the increased production

A good No. 9 plant could have been built between 1910 and 1916 at a cost of from $90,000 to $150,000. Such a plant can today be converted into a steam shovel loading plant by the addition of a No. 12 gyratory crusher and the necessary re-crushing and screening accessories, together with a heavy duty steam shovel and new heavy quarry cars at a cost of from $90,000 to $120,000. While the cost of such a plant transformation today is a least a 100% advance over 1916, the practical assurance of adequate demand for one's product warrants the transfomation of these small plants even at present high prices for equipment and installation.

Remember that this country with its prospective road building is crying for the increased tonnage.

The modification of existing plants herein discussed means the changing of a 200 ton per year plant into a 400 ton per year plant. It means doubling the production with less than 50% of the present staff of employees which in itself in these days of labor scarcity is no inconsiderable item.

It means, if one cares to put it that way, the return of the entire investment for the rehabilitation of the plant and equipment within the next two years. It means a handsome return to investors and fine profits to the operators.

It has occurred to the writer that he may be acccused of departure somewhat from his text viz, "How shall we increase the output of existing plants?" His justification is that these hand loading plants will not for many years be "existing plants," unless the changes herein suggested are made promptly. To paraphrase a recent popular song known as "Mr. Zip, Zip, Zip," "If the Steam Shovels don't get you the Sheriff must." With the present scarcity of, and high prices for labor the hand loading plant cannot long exist in close competition with the steam shovel loading plant. The time is ripe for these small plants to reorganize for higher production and the improvement and rebuilding of American highways

Other Suggestions for Increasing Outputs.

As has been before stated, much of what has been given in this discussion is equally as applicable to sand and gravel plants as to stone crushing plants. The general principle of substituting machinery for hand labor wherever possible applies to all road materials—cement, asphalt, and tar products. Cement is today essentially a machine made product. The elimination of manual labor in the preparation of asphalt and tar products has progressed rapidly during the past decade.

It has been suggested that the production of crushed rock and gravel may be increased in existing plants by working out some definite plan of cooperation between employees and the management of various plants.

This is hardly a new proposition in manufacturing business. Various bonus and so-called profit sharing systems have been tried from time to time in many industries, with varying degrees of success. It has recently been brought to the attention of the writer that one of the gravel companies in the Chicago District has operated for one season under a bonus system quite successfully. A basis cost per ton is set in accordance with past experience. Any saving below this cost is divided pro rata to the fixed wages of the employees, among all of them. If there is no saving, there is no bonus and the management stands any increase above the basic cost. There are serious objections to this system. One is that in a one steam shovel plant, whether the output is increased and the cost consequently decreased depends on the work of not more than 10 men out of a total of about 40 men who should be employed at such a plant. No matter how diligent and faithful the other 30 men may be, the output of the plant depends on the superintendent, the steam shovel crew and a few of the attendants at the initial crusher. It seems to the writer that a bonus to those 10 employees only would be more likely to produce satisfactory results than a division among the larger number whose duties are such that their diligence or lack of diligence can in no wise affect the output of the plant.

Again, if a substantial bonus is earned one month and no bonus the succeeding month, labor, in its present mental attitude, will probably demand an addition to its wages equal to the bonus.

Double Shifts

An effective method of increasing the output of existing plants is the working of double shifts through the busy season during the months of July, August, September and October. By timing these two successive shifts so that the first starts work at, or shortly before, sunrise and the second follows 8½ hours after the first starts, one-half hour being allowed for luncheon for each crew, the working of two 8-hour shifts is perfectly feasable, and has been successfully accomplished.

This necessitates an increase in the normal force of not over 60%, as shop men and repair men may be worked 10 or 11 hours, their shift starting three or four hours after the early operating shift and continuing through the early hours of the second operating shift.

Open Shop

The writer has always operated under the open shop system. Some employees are union men; others are not. From a long experience in the handling of both union and unorganized labor, the writer is firmly convinced that production would be increased and labor troubles minimized under unions controlled and officered by honest officials. Since the present shortage of labor, our troubles have been not with organized labor but with the "clicques" of so-called unorganized laborers whose demand for more money and still more money are vociferous and continuous. In the writer's experience the labor organizations with which he has dealt have lived up to their agreements, have tended to stabilize the industry and improve working conditions and increase the output. In fairness to organized labor it is a satisfaction to be able to pay this tribute.

The writer has attempted in this paper to briefly suggest some things which may be of benefit to operators in increasing output of existing plants for the carrying out of the great road program this country has prepared. This article is probably far from being an exhaustive treatise on the subject. If, however, it shall contain any suggestions of practical value to those engaged in the production of materials for road building if its influence shall even in a small degree increase the output of existing plants and speed up this great national movement for better highways for America, he will feel that it has been worth while and has not failed in its purpose.

Motor Fees as a Basis for Bond Issues

Explanation of the Conditions Governing the Financing of Road Work in Illinois and a Defense of the Illinois Bond Plan

By S. E. BRADT*

The clippings that come to my desk indicate that some people far away from Illinois and unfamiliar with Illinois conditions are taking occasion to criticize our plan of promoting highway construction. These same people claim to speak for the motorists of the country, saying that the motor fees should be set aside for maintenance purposes, rather than for construction or a basis for bond issues. They claim that the use of motor fees for construction purposes is inequitable, because all people receive a benefit from road improvement and that the direct benefits to the motorist are incidental and secondary.

Who are these motorists whom they claim to represent? Are they a separate and distinct class of our people, separated by a peculiar profession or occupation? The fact is that these motorists are the farmer; the miner; the merchant; the mechanic; the banker; the shopman; the lawyer; the doctor; the preacher, and finally, the legislator who makes our laws. They are the men who approve or disapprove, through their ballots, all unusual matters of taxation which include bonds and special levies for road improvement. They pay 100% of the motor fees and probably over 90% of the general taxes. There are at the present time approximately 7,500,000 cars registered in the United States. Later estimates claim the number registered will be 10,000,000 by the end of 1920. Counting a car to a family of six persons you will find that 45,000,000 of the 110,000,000 of the people are motorists in the proper sense of the word. In the State of Illinois these motorists constitute approximately 50% of the population and hence 50% of the voters; and if they are 50% today they will soon be 60 to 75%. It is from this 50% of our people that 90% of the legislators are drawn. This proportion is not the same in all states. In some of the states the motorists are more than 50% of voters; in other states less; but they constitute the active, influential force in every community and every state.

This motorist is a man who thinks for himself. He knows conditions in his own state and he knows public sentiment. He has assigned to no individual or organization the right to speak for him; he has no advocate or special pleader; no one holds a brief for him. He will brook no interference from special interests, either outside or inside of his state. He is his own boss; and if he prefers to take the money for highway improvement out of his right hand pocket or his left hand pocket, it is his money and his own affair; and you can depend upon it that he will settle that question without interference or assistance.

These clippings indicate that the writers are not familiar with the Illinois plan. They give the impression that the entire road improvement in Illinois is paid from motor fees. The fact is that the people of Illinois have said that the state-wide system of 4,800 mi. shall be improved from the proceeds of bonds, which are to be liquidated from motor license fees. This 4,800 mi. constitutes, however, only 5% of our 96,000 mi.; thus there remain 91,200 mi. to be improved by general taxation, and the motorist instead of being called upon to pay the entire cost of highway maintenance and improvement in the State of Illinois is paying for the improvement and maintenance of only 5% of the Illinois roads. To show what is being done by general taxation, let me say that the counties of Illinois have already voted approximately $15,000,000 in bonds for road improvement; and if satisfactory conditions for construction, as to car service, supplies of material, labor and contractors, could be relied upon so as not to interfere with the state program, not less than $75,000,000 additional would be submitted to the voters in about 40 counties of Illinois during 1920.

All county bond issues must be paid by general taxation. It is not necessary to state that during the life of the bonds which are to be issued by the state and paid by motor fees a sum several times as large will be voted by the counties and townships to be paid by general taxation.

Illinois has at the present time approximatey 600 mi. of hard-surfaced, state constructed roads which it is obliged to maintain and which it is maintaining from motor license fees with about $100,000 per year. The remaining roads of the state are maintained by the local authorities which heretofore have been raising about $8,000,000, but which hereafter are entitled to raise in excess of $12,000,000 per year for that purpose. The revenue from motor fees is in excess of $5,500,000, with only $100,000 reserved for maintenance. What would our friends suggest that we do with the $5,400,000?

With the maintenance of our roads taken care of and only a very small part of the roads properly improved, the voters of the state decided by a vote of 660,000 to 154,000 that this money should be made a basis for bonds and the proceeds of the bonds used to construct a system of main traveled thoroughfares, the construction to be of such type as would give a maximum amount of service at a minumum of maintenance cost. A more equitable and sensible solution of the problem could not well be devised.

As I have indicated, Illinois is at present maintaining, and proposes in the future to maintain, its state roads from license fees, and it is apparent that these fees will not only maintain these roads but will furnish sufficient funds to retire the bonds which we propose to issue for construction.

Some critics contend that the motor tax is inequitable and uneconomic when used for construction purposes because, as they claim, it fails to recognize the fundamental basis of taxation: namely, that the taxes should be levied in proportion to the benefits. With this we disagree. We all recognize that there are certain indirect benefits coming to every citizen of the state, including the motorists, from highway improvement. This is amply taken care of through general taxation. We also know that by far the greater benefit is a benefit accruing directly to the users of the road. Is there any reason why we should be prevented from paying for that direct benefit? No one realizes the direct benefit more than the motorist, and he is invariably willing to make a reasonable payment therefor.

The motor license fee law of the State of Illinois comes nearer to applying the fundamental principle, above referred to, than any other revenue law upon the statute books of this state or any other state, so far as my information goes.

I have not written this article for the purpose of trying to influence any state toward any particular policy or method in the expenditure of its motor license fees or for the purpose of urging any state to adopt the plan which we are using in Illinois. My sole object is to call attention to the well known fact that conditions in the several states differ, and to make a plea for the permission of each state, knowing is own conditions, knowing it own people, to use those

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*Superintendent of Highways, Illinois Department of Public Works and Buildings.

GOOD ROADS
CONSTRUCTION TRANSPORTATION MAINTENANCE

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STANDARD TESTS FOR ROAD MATERIALS

The progress of a nation depends largely upon the application of engineering principles to the standardization of industrial and commercial processes. Looking back upon the business expansion of this country, one can clearly trace the enormous influence of mechanical and chemical engineering upon it. In almost all manufacturing, careful research has been combined with shop experience, to the end that processes and products have been standardized. Thus has maximum efficiency been secured. And today the watchword of progress is standardization.

Highway engineering is one of the youngest offspring of general engineering and although it still lacks in some measure the more mature understanding of the facts in its field such as its older sisters have derived from long experience, nevertheless it has emerged from its period of infancy and is moving forward rapidly. However, there still remains a trace of its childhood which is now an obstacle in its development—the multiplicity of tests for road materials in this country.

The standardiation of methods and materials used in road building bears an important relation to the development of highway engineering and in view of this fact a conference was recently held in the offices of the Bureau of Public Roads under the auspices of the American Association of State Hghway Officials, to evolve a system of standardized tests for road materials to be used in all the states

It is well known that much confusion and uncertainity obtain at the present time because of the varying tests for road materials throughout the country. A manufacturer may sell material in one state and find that the same material is rejected in another because of different requirements or merely different interpretations of similar specifications. Contractors experience difficulty in preparing bids and the work of highway departments becomes needlessly slow and detailed With the adoption of a system of standard tests for road material throughout the country, many of the present difficulties should be removed.

THE EXPRESSION OF MAINTENANCE COSTS

A great deal of emphasis is due to a point in reference to the expression of maintenance costs that was made at the recent convention of the American Road Builders' Association at Louisville, when one of the speakers urged that such cost be given per ton-mile of the traffic using the road.

The cost of maintenance is almost always expressed in terms of miles and years. Statements that the expenditure for upkeep on a given road amounted to a certain sum "per mile per year" are made daily. And they are made by those who ought to know better, for they mean nothing.

In the first place, the term "maintenance" itself is not always definite. Frequently it is used to denote work that ought really to be classed as reconstruction. More often it is applied to the care of the paved area only, no account being taken of the maintenance of the shoulders, ditches and culverts, the care of the roadside or any of the incidental work properly classed as maintenance.

But even were all these included, a cost of so much "per mile per year" would still be meaningless, for it would convey no knowledge of the traffic carried by the road. Just as the traffic to be carried must eventually become a determining factor in the design and construction of roads, so must it enter into calculations of the cost of maintaining roads, if maintenance costs are going to be of any value.

Even the most superficial consideration will demonstrate how widely different are cost "per mile per year" and cost "per ton-mile." For instance, the maintenance cost on a given piece of road might be very reasonable, all factors considered, and it might—and probably would—be given as so much "per mile per year." Due to some change in the kind or volume of business in a community it served, the number or weight, or both, of the vehicles using it might be doubled. The gross cost of maintaining it, of course, would increase very greatly. So would the cost "per mile per year." But the real maintenance cost, the cost per ton-mile of traffic using it, might not increase very greatly. In fact, it might remain the same or even become very much lower.

Expressing the cost of maintenance in terms of ton-miles of traffic carried may not be the best method, but it is obviously preferable to expressing it in terms of the mile and the year.

CONVICT LABOR

During the past two years the Arkansas Department of State Lands, Highways and Improvements has tried convict labor on roads and, as has usually been the case where a fair trial has been given, the experiment has proven successful.

There is nothing new in convict labor. But in many of the states little use has been made of it for road building, though the laws of most of our commonwealths permit it and the reports from those states which have so utilized it have been generally favorable Often where unsatisfactory results have been secured, the reason has been an attempt to utilize the prisoners in work for which they were not fitted. As is pointed out in an extract from an Arkansas report, printed on another page, the saving effected by the emloyment of convicts "must be derived from the labor itself." This has very often been lost sight of in the direction of road work by convict labor.

At this particular time, when free labor is so hard to obtain, so costly, so inefficient and so generally unsatisfactory, a greater utilization of the work of the inmates of our prisons and jails would seem to offer at least a partial solution of the labor problem.

Motor Fees as a Basis for Bond Issues

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fees as the judgment of the residents of the state may determine without outside interference.

If the State of New York or the State of Michigan or any other state requires all of the funds derived from motor license fees for maintenance there can be no objection; on the other hand if the State of Alabama or Georgia or any other state wishes to use its motor license fees for road construction by a bond issue or otherwise, that is its affair. The real test is not whether the money comes from motor license fees or general taxes, but how it is expended. If we spend it wisely and honestly the people will furnish it unstintingly.

Convict Labor in Arkansas

Use of Prisoners in Road Work is Advocated in an Extract from the Forthcoming Report of State Highway Commissioner Owen Printed in Official Publication of the Department of State Lands, Highways and Improvements

It has been the opinion of the Department for some time that convict labor would prove a great help in road building and it has been tried out in a small way during the present biennial period.

One hundred convicts were used as common labor on the Camp Pike Road construction and proved that they could be made to pay all expenses and actually make money for the state. Seventy-five of these convicts were transferred to Carroll County after the completion of the above project and have been used by the commissioners on their road construction. They are hired at $2 per day, and each month a good amount of profit has been turned over to the Penitentiary Commission.

The men are perfectly satisfied with camp conditions and good results are obtained from their work.

Our experience has proven that the only saving which can be made by the use of convict labor must be derived from the labor itself, and it naturally follows that the kind of work best adapted to the employment of convicts is that in which the labor forms the largest part of the whole cost. We are convinced that of the various kinds of work performed, clearing, grubbing and excavation are best adapted to the employment of convicts, and that such work as culvert and bridge construction is to be avoided wherever possible.

Most roads throughout the state are nothing more than narrow paths. All will have to be widened to standard width. We know that a substantial dump with the necessary side ditches is absolutely necessary in road construction and this character of work can be performed by convicts to great advantage.

By dividing the working gangs into squads of 40 or 50 men, efficient work should be done in every county in the state within the next biennial period.

Records show that convict labor with the necessary houses and materials make excavation cost on an average of 20 ct. per cubic yard. Therefore, on a basis of 5,000 cu. yd. of excavation per mile, the convict labor with the necessary teams and implements would cost $1,000 per mile, which is quite a saving to the taxpayers who are paying on an average of 35 ct. per yard at this time.

Indiana State Highway Organization

Organizes Maintenace and Construction Divisions and Cuts State Into Districts with Resident Engineers—2000 Patrolmen will Watch Roads and Make Minor Repairs

Plans of the organization of the Indiana State Highway Commission for the construction and maintenance divisions have been recently announced. The construction division will have the supervision of the work of construction of 135 mi. of state and federal aid roads and the maintenance division will care for more than 3,000 mi. of state roads. The construction division is under the direction of H. K. Bishop, Chief Engineer, and the Maintenance Division is under A. H. Hinkle.

The counties of the state have been grouped into eight districts by the construction division and five resident engineers have been appointed to have charge of the work of the division in the eight groups. The men and the cities in which they will have ther headquarters are: W. R. Britton, Plymouth; K. J. Eisenhardt, Terre Haute; Leslie Doan, Kokomo; J. S. Neibert Indianapolis, and B. R. McBride, Seymour.

The maintenance division has divided the counties of the state into five groups with the following engineers in charge: A. O. Hastngs, Greenfield District; H. C. Offutt, Vincennes District; W. K. O'Niell, Seymour District; Walter T. Horn, Fort Wayne District, and E. B. Lockridge, Northwest District.

It is planned in the maintenance division to place under each engineer of a district five superintendents who will be assigned to the various cities and towns and who will have charge of patrolmen and floating gangs repairing and resurfacing the roads. To each man a certain mileage will be allotted and he will be provided with a motor truck. About 200 patrolmen are to be employed and there are to be 10 to 15 floating gangs that will do extensive road repair work and distribute material. Under the present plans each engineer will have supervision of about 600 mi. of road and each superintendent 120 mi.

The duty of the patrolmen will be to keep informed of the conditions of the roads at all times, to make minor repairs and to report serious impairment of the roadbeds to the engineer who will assign a gang of workmen to repair the road.

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Speaking before the Illinois Highway Association, Governor Lowden said recently, "The contractors want to build the roads on a basis of cost plus a reasonable and certain profit, instead of an average price of $32,000 a mile. That cost plus system would mean $50,000 or $60,000 a mile." Continuing his speech, he said that road building would go forward as fast as possible so long as the price was not artificially raised beyond a limit that the state could tolerate.

The Construction of 800 Miles of Highways in Pennsylvania during the coming season is planned by the Highway Department of that state. Most of this mileage is on the primary system of highways and the opening of bids will continue until all contracts have been awarded for the 1920 program. Last year contracts for 665.6 mi. of highway, embracing 188 projects, were let by the department. This was a considerable increase over the construction program of 1918, when contracts were awarded for the construction of 129.66 mi.

HIGHWAY TRANSPORTATION

Transportation Engineering Recognized

Creation of Institute of Transport in England a Development of Great Moment

By A. JACKSON MARSHALL*

The day when the title of "Transportation Engineer" will be conferred by educational institutions of recognized standing continues to advance, the importance of transportation and the necessity of unbiased, intelligent consideration of this subject forcing such recognition While we have mechanical, electrical, civil engineers, etc., the products of scientific schools which confer such recognized titles, as yet the transportation engineer does not exist except where such title is self-appropriated—sometimes by well informed men who function as engineers, more often as salesmen camouflaged as engineers who find such designaton useful in the disposal of their equipment Such ruse, however, will outlive its usefulness without injuring permanently the principle involved, although such practice may retard the development in its early stages by arousing suspicion as to motives and methods involved, which always may not be engineering in the strict sense of the word

Transportation engineering means much more than selling trucks There are "a thousand and one" points to be considered and determined before specifications should be drawn for truck equipment which, under such circumstances are bought rather than sold Besides, the method of operating such equipment, including all-embracing cost accounting, must be predetermined—and employed—if best results are to be seccured The ramifications of transportation are legion, being related to every branch and phase of industry. Life, itself, is dependent on transportation, which meets nature at the source, permits of manufacture in all its stages, serves the merchant and the ultimate consumer and then disposes of the waste. To trace the transportation of almost any commonplace commodity through these various stages—from the raw material to the finished article, and then its disposal—is a fascinating study which will reveal how vital transportation is; also the large percentage which it represents in the final total cost of a commodity

In this connection it is interesting to note that on November 3, 1919, a meeting was held in the Savoy Hotel, London, to inaugurate an Institute of Transport It is stated that the main object of this instiute will be "to promote and encourage knowledge of traffic science and of the art of transport in all its branches, and the means and appliances connected therewith; to provide facilities for the study of and the exchange and ideas on traffic problems and all means and methods of transport; and to raise the status of those engaged in traffic and transport." Meetings will be held for the reading and discussion of papers on traffic and transport; lectures will be delivered; classes and examinations will be held; exhibitions will be promoted; and other measures taken to advance the science of transport. Provison is made for members, associate members, graduates, students, and honorary members. The chief qualification for membership is experience involving superior official responsibility with at least ten years' servce in traffic or transport, but provision is also made for electing as members any one whose association with the objects of the Institute is prominent enough to justify his election Associate members are to be elected on a similar basis but the necessary period of experience is only five years in a responsible position. Graduates must have at least three years' experience in traffic or transport; and students are to be elected on the usual basis.

"The Electric Vehicle," the official organ of the Electric Vehicle Committee of Great Britain, states that:

> About the value of such an Institute there can hardly be two opinions. Transport is a science which has hitherto been conducted in compartments between which there was a corridor used only at rare intervals. The men engaged on railways, tramways, motor omnibus services, heavy motor transport, local delivery work, dock haulage, and shipping seldom if ever had the chance of meeting to discuss their daily work in its proper perspective as part of the great machinery of transport. In the discussion of many traffic problems we see the effects which flow from the lack of a clearing house of experience and information. The relative spheres of railways, tramways, and motor omnibuses are not appreciated, because the traffic officers are more concerned about competitive than complimentary relations. In road transport we have vehicles drawn by steam, petrol, gas and electricity; and the advocates of each system push their claims just as far as the othres will let them. This unrelieved struggle would be efficient if there were not more than one ultimate solution to the problem of road transport, but it is only the one-eyed enthusiast who does not see a different solution for every phase of a most complex problem. Even the horse, upon whom sentence of death has been pronouncd by the united authorities of mechanical transport, will find a corner of usefulness somewhere. The roads of tomorrow will carry every kind of vehicle from a road train to an autoscoter, each performing its most efficient service in relation to the nature of its load, the distance to be traversed, and the speed desired. A real all-round traffic expert is a man who can select for each demand the type of vehicle and organization suited to give the best results.
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> It is, however, unfair to the electric vehicle world to say that "The advocates of each system push their special claims just as far as the others will let them." In the vast majority of cases electric vehicle advocates have carefully limited their attention to the field in which battery traction gives permanently satisfactory results. This is undoubtedly the best policy in the long run, but it required a certain amount of restraint for a manufacturer or an agent to choke off a customer who is ready and even anxious to try electric haulage, although the conditions are more suitable to some other type. Not only is an immediate profit sacrificed, but a definite risk is run of the refusal being misunderstood. In a recent case an electric vehicle firm refused to quote for wagons to haul heavy loads up a long and severe incline to a trip, returning empty down hill. There is no question of the physical ability to meet such a demand electrically, but the very qualities which make battery traction economical in other circumstances tend to make it less efficient than steam or petrol in this case. Nevertheless, the refusal to quote was treated as a failure of electricity in a wrestling bout with petrol. The prejudicical effect of this sort of treatment upon the reputation of battery traction is, however, less serious than the revelation it supplies of the absence of the element of cool science in the treatment of traffic poblems. In the Institute of Transport can inject a little of this element into the brains of traffic experts it will perform a magnificent service.

The Electric Vehicle Section (formerly the Electric Vehicle Association of America), National Electric Light Association, has been promoting the principle of transportation engineering for several years, believing that the public in general would be immeasurably benefitted if all transportation problems were accorded thorough engineering consideration. More recently, in order that this subject would be speedily and systematically advanced, the section created the Transportation Engineering Committee The function of this committee, in part, is "to analyze transportation conditions and requirements and to collect operating data as a basis for formulating an educational course in transportation engineering, to correspond and confer with educational institions with the idea of cooperating in the establishment of transportation engineering courses;" and "to interest consulting engineers in transportation engineering." This committee is in correspondence with 155 educational institutions in the matter of creating and installing courses in transportation engineering. Remarkable interest has been evidenced. It is the desire of the committee that any course, or courses, adopted shall be all-embracing in character, not confined to any one or few types of equipment or methods, but to be of such nature as to qualify men to handle all transportation problems in a thorough, unbiassed manner

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*Secretary, Electric Vehicle Section, National Electric Light Association.

There has been some consideration given during the last few years to the formation of a society similar to that which has actually been inaugurated in England, and it will be interesting to observe what effect the English development of this important matter will have on crystallizing similar activities in America

Safety of Truck Transportation

Small Risks Attending Shipment of Goods by Motor Truck Not Given Enough Thought

Little thought has been given to the great safety of merchandise shipped by motor trucks, according to Sidney B. Bowman, of the Sidney B. Bowman Automobile Co., New York distributors of Kissel machines

He believes this is a point in regard to motor transportation that has very largely escaped notice, and points out that it is very rare that motor trucks loaded for overland transportation become stalled or that the goods are either stolen or damaged on the way. "This factor alone, that of safety of commodities and merchandise," he says, "has caused a great many business houses to give preference to the motor truck, especially on short-haul routes. There are many reasons, for this, chief among them being that the motor truck has no prescribed route it must follow, and it is natural that the driver selects the road that is in the best condition.

"Again owing to the high development of the motor truck, manufacturers have made them not only easy to operate but their big safety factor enables the motor truck to overcome road obstacles insurmountable by other common carriers.

"Goods transported by motor truck are only handled twice—loading on to the truck and unloading at the consignee's door. The motor truck driver takes pride in his work, which enables him to drive his truck to destination without any delay and in as quick time as safety and economical operation of the truck warrants."

Trucks for Highway Departments

One Shipment in the Delivery of 25,000 Surplus Motor Trucks of War Department to the States for Use in Road Building

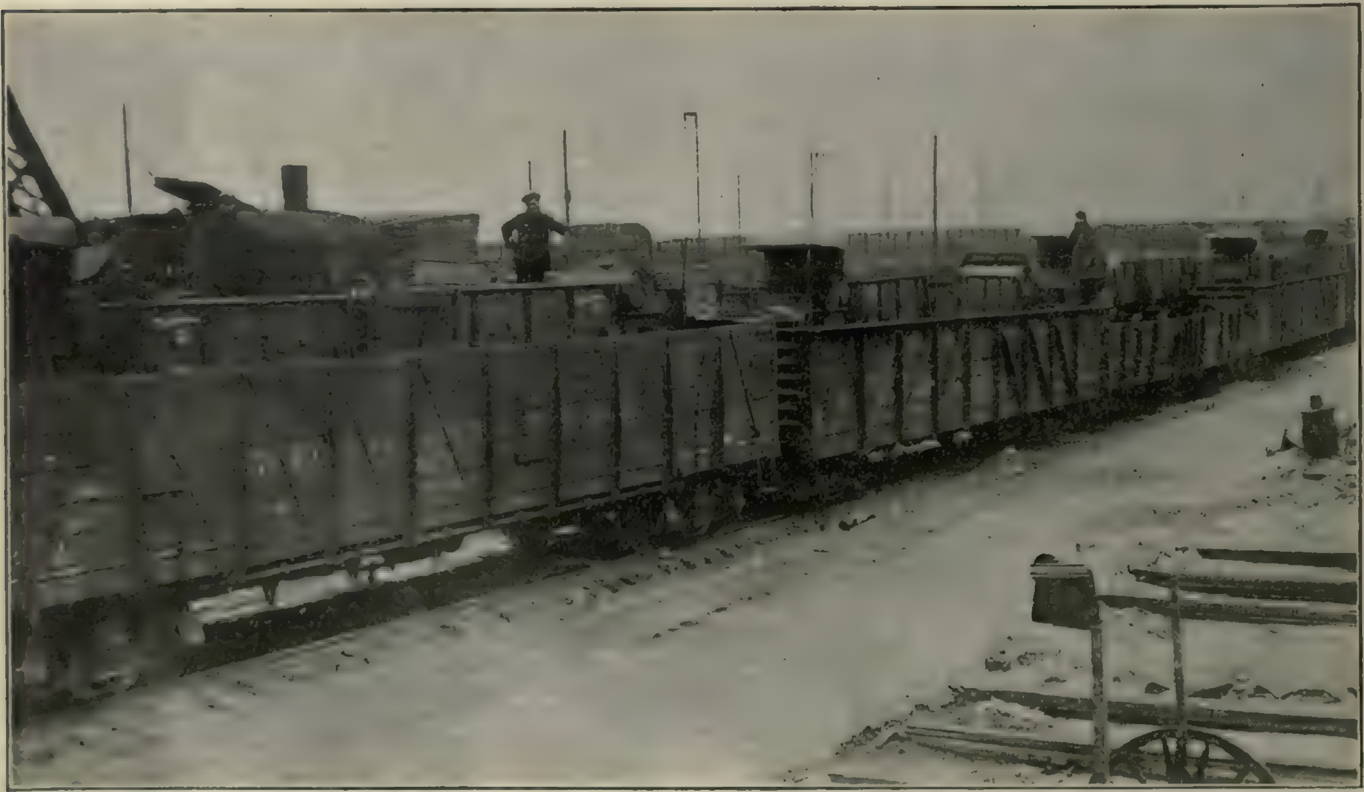
In the accompanying illustration is shown a train load of FWD trucks leaving the Municipal Pier at Chicago, Ill., for use in road work in various states.

These trucks are a part of the 25,000 machines declared surplus, and ordered turned over by the War Department to the Department of Agriculture for use by state highway departments in federal aid road work.

Of the 15,000 military trucks turned over to the Government by the Four Wheel Drive Auto Co., of Clintonville, Wis., there now remain over 2,000 machines as a surplus. These are being shiped out at the rate of about 100 a day from storage centers at Chicago, Ill., Indianapolis, Ind., and Ft. Monroe, Va. At least two of the FWD machines, according to G. P. Hewitt, General Sales Manager of the Company, will be sent to each state, in one case a state receiving 58 of this make.

———ooo———

The Province of Ontario, Canada, plans to take over 1,600 mi. of country roads as provincial highways. The cost of improving these roads will be borne by the Dominion, the province and the municipalities. The federal grant will amount to 40%, the province will pay 42%, and the municipalities 18%. It is stated that the province will receive $6,000,000 from the Dominion Government during the next five years.



TRAIN LOADED WITH FWD TRUCKS LEAVING MUNICIPAL PIER, CHICAGO, ILL.—PART OF SURPLUS WAR STOCK TURNED OVER TO DEPARTMENT OF AGRICULTURE FOR DISTRIUBTION TO STATES FOR ROAD WORK.

MEETINGS

Calendar of Coming Meetings

Apr. 12-17—United States Good Roads Association—Eighth Annual Convention, Hot Springs, Ark. Director General, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

Apr. 16-17—Bankhead National Highway Association—Fourth Annual Convention, Hot Springs, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

Associaton of Mississippi Valley State Highway Departments

Urging the federal appropriation of $100,000,000 for road building in the four fiscal years 1920-1923, the annual conference of the Association of Mississippi Valley State Highway Departments was held Feb. 4, at the Hotel LaSalle. Chicago

The association also passed resolutions protesting against any plan by which a federal highway commission might build roads without state cooperation and condemning propaganda "carried on by the American Automobile Association and other interests" to lower motor vehicle fees "regardless of circumstances existing in several states in regard to financing necessary highway mprovements."

Frank F. Rogers of Lansing, Mich., was elected president of the association and Alexander Graham, of Jefferson City, Mo., secretary.

American Association of State Highway Officials

A conference was recently held under the auspices of the American Association of State Highway Officials in the offices of the Bureau of Public Roads, Department of Agriculture, Washington, D. C., to formulate a system of standardized tests for road materials. It is hoped that from the suggestions of those in attendance, which included highway testing engineers representing most of the states, a system of tests will be evolved which will elmininate the confusion and difficulties that have come from the use in different states of varying tests for materials used in road construction.

Manufacturers of road materials, as well as the federal and state highway departments, have been inconvenienced, because materials that would meet the requiremnts in one state would be rejected in another, often because of differing interpretations of specifications. The fact that considerable road work is done cooperatively by the federal and state governments under the Federal Aid Road act is one of the reasons why it has been thought advisagle to get up national standards which will be in effect in all states.

The American Association of State Highways Officials will promulgate the standarized tests, it is stated, and it is expected that they will be adopted generally, although their use by the states will be voluntary Besides a number of engineers connected with the Bureau of Public Roads, the following officials and engineers of state highway departments were in attendance:

T. R. Agg, Iowa; R. L. Saunders, Connecticut; W. F. Purrington, New Hampshire; R. B. Gage and J. G. Bragg, New Jersey; N. H. Ulman, Pennsylvania; A. S. Rea and W. D. Martin, Ohio; F. L. Roman, Illinois; D. V. Terrell and J. F. Grimes, Kentucky; F. C. Lang, Minnesota; R. B. Dayton, West Virginia; M. O. Withey, Wisconsin; F. T. Maddocks, California; W. F. Cooper, Louisiana; R. A. Seaton, Kansas; F. C. Rossel, Maryland; H. W. Leavitt, Maine; R. B. H. Begg, Virginia; W. S. Fallis, North Carolina; H. B. Henderlite, North Carolina and A. W. Dean, Massachusetts.

The Canadian Good Roads Association will hold its seventh annual good roads convention and exhibition in the City of Winnipeg, Man., on June 1, 2 and 3, 1920 at the Royal Alexandria Hotel. An interprovincal conference of highway officials in Canada and the attendance of the Canadian Federal Highway Commission will be special features at this meeting.

—OOO—

The City of Warren, Pa., will increase its mileage of paved streets by 50% during the coming season. It is planned to pave 7 mi.

Seeking to Issue $390,400 of Road Bonds, Marion County, Indiana, recently filed petitions for permission to issue this amount of 4½% bonds. The petitions were divided as follows: Lawrence and Washington townships $113,000; Franklin township $40,300; Wayne township $81,000; Center township $156,000.

In Pursuance of the Policy of New York in the Acquisition of Toll Bridges, a bill has been introduced in the Legislature of that state appropriating $125,000 for the state's share towards purchasing four bridges crossing the Delaware River between New York and Pennsylvania, at Port Jervis, Callicoon, Barryville and Narrowsburg.

The Erection of a Memorial Arch at Blaine, Wash., on the international boundary line to commemorate the century of peace between this country and Canada, is being urged by many citizens of Washington and British Columbia. Samuel Hill, of Seattle, President of the Pacific Highway Association, is leading the movement for the arch.

The Automobile Club of Buffalo, N. Y., and a number of other automobile organizations in the state are urging legislation to provide for keeping highways open during the winter months. It is argued that besides benefiting all-year traffic, the removal of snow and ice will help to preserve roadbeds and eliminate much repair work necessary each year.

Fatalities on the Highways of Iowa, numbered 203 during the year of 1919, according to the Iowa State Highway Commission. Fifty of the deaths were caused by railroad crossing accidents. The report further stated that the total number of accidents during the year was 2,809, with 2,708 people injured. Several unusual fatal highway accidents were mentioned in the report. During a severe wind storm an automobile and its driver were crushed in that state by a heavy limb torn from a tree along the roadside. Another person lost his life when his car struck a dog and swerved from the road. In one case a car was stalled on a hill and started to move backward down the hill. A woman with her child were in the car and she jumped out with the child who slipped from her arms and was killed. A man was backing up his car one day and ran over and killed his own child.

PERSONAL MENTION

George T Austin has been appointed city engineer of Effingham, Ill.

C. W. Collins has succeeded A. W. Vars as town surveyor of Westfield, N. J.

R. W. Dowell has been appointed county engineer of Grey County, Ontario, Canada.

L. Leon Theriault has been appointed town manager of Edmundston, N. B., Canada.

L. A. Amsden has resigned as city engineer of Ashtabula, Ohio, after 21 years of service.

LeRoy F. Clark has resigned as city engineer of Batavia, N. Y. and will enter private practice.

W. C. West, of Buckhannon, W. Va., has been appointed Road Engineer of Houghton County, Michigan.

C. L. Wood, County Engineer of Lowdes County, Mississippi, has been reappointed at an increased salary.

Alexander W. Vars is now city engineer of Plainfield, N. J., having resigned as town surveyor of Westfield, N. J.

Judge B. M. Allen, of Birmingham, Ala., has been elected president of the Bankhead National Highway Association.

W. J. Moore, of Pembroke, Ont., Canada, has succeeded J. R. McQuigge as road superintendent of Renfrew County, Ontario.

Earl W. Sayles, for the past eleven years city engineer of Watertown, N. Y., has resigned and will enter private practice.

H. S. Perry has been appointed assistant to A. H. Hinkle, Chief Engineer of Maintenance of the Indiana State Highway Department.

C. R. Stanhope was recently appointed city engineer of Ashtabula, O., filling the vacancy caused by the resignation of L. A. Amsden.

James R. Nevin has been elected county engineer of Jefferson County, Iowa, succeeding Don L. Teal, who has accepted a position with the Iowa State Highway Commission.

George M. Shepard, of St. Paul, Minn., has recently become associated with Louis P. Wolff, consulting engineer, of St. Paul, in his practice of municipal and sanitary engineering.

Frank W. Cloman has been appointed advertising manager of General Tractors Inc., of Chicago, Ill. Mr. Cloman has just been released from the Army after service in France with the Engineers. He has had wide experience in the advrtising of tractors and other automotive products, having been connected with the Dart Motor Truck Co., the Wm. Galoway Co. and Continental Motors.

R. E. S. Geare has been appointed general sales manager of the T. L. Smith Co., of Milwaukee, Wis., and will have charge of the company's general sales office in the Old Colony Building, Chicago, Ill., where the advertising and sales departments are now situated. For the past four years Mr. Geare has been in business under the name of Geare & Co., Engineers, specializing in sales engineering in the construction and power plant fields.

F. W. Cappelen, City Engineer of Minneapolis, Minn., recently appeared before the City Council and asked for increases in salaries for himself and heads of three engineering departments.

F. M. Clarke has been appointed assistant chief engineer of the Nova Scotia Highways Commission. Mr. Clarke was at one time connected with the New York and Virginia State Highway Departments and later was with the Barrett Co., Ltd., in charge of the construction of the road between St. John and Rothesay, N. B.

W. C. Turner has been appointed district sales supervisor of the Four Wheel Drive Auto Co., of Clintonville, Wis. Mr. Turner will cover Nebraska and Iowa, with headquarters at Omaha. Mr. Turner served in the Motor Transport Corps of the Army and was in charge of a motor supply train base at Waco, Texas. He was formerly employed by the Packard Motor Car Co. at Chicago, Ill.

PUBLICATIONS

"THE ATLANTIC MOTORWAY," a motoring guide from New York, N. Y., to Miami, Fla. Paper, 4x9¼ in., 48 pages with 20 maps.

This booklet contains the details of the overland route from New York City to the Florida resorts, including a complete itinerary featuring Washington, Richmond, Old Point Comfort, Raleigh, Pinehurst, Camden, Aiken, Augusta, Savannah and the East Coast of Florida.

DISTRICT OF COLUMBIA, ENGINEER DEPARTMENT; annual report for the year ending June 30, 1919. Paper, 9x5¾ in., 196 pages and covers.

This comprises a detailed report of the operations of the department and includes the reports of the highway engineer, the asphalt and cement inspector, the superintendent of suburban roads and the superintendent of streets. Detailed financial and statistical tables are included, covering construction and maintenance work performed during the year.

DELAWARE STATE HIGHWAYS, bulletin of the Deleware State Highway Program. Paper, 6½x10½ in., 55 pages and covers, with maps and illustrations.

The Delaware State Program is the designation of a publicity and information bureau representing the State Board of Health, the Board of Education, the State Highway Department, the Reconstruction Commission and the Survey Commission. This bulletin treats of the history of the State Highway Department and outlines the policies and plans of the department. It also gives a brief resume of state highway finances, and contains other information for the public.

———OOO———

The Annual New Yor Appropriation Maintenance Bill for state highways was recently introduced in the Legislature by Senator Sage. It asks for $6,867,000.

The Indiana Dunes Highway, between the Illinois state line and Michigan City, Ind., has been taken over by the Indiana State Highway Commission and will be improved with the aid of federal money. The highway will be the shortest motor route between Chicago and Detroit. Only 25 mi. of highway remain to be constructed, between Gary and Michigan City.

GOOD ROADS

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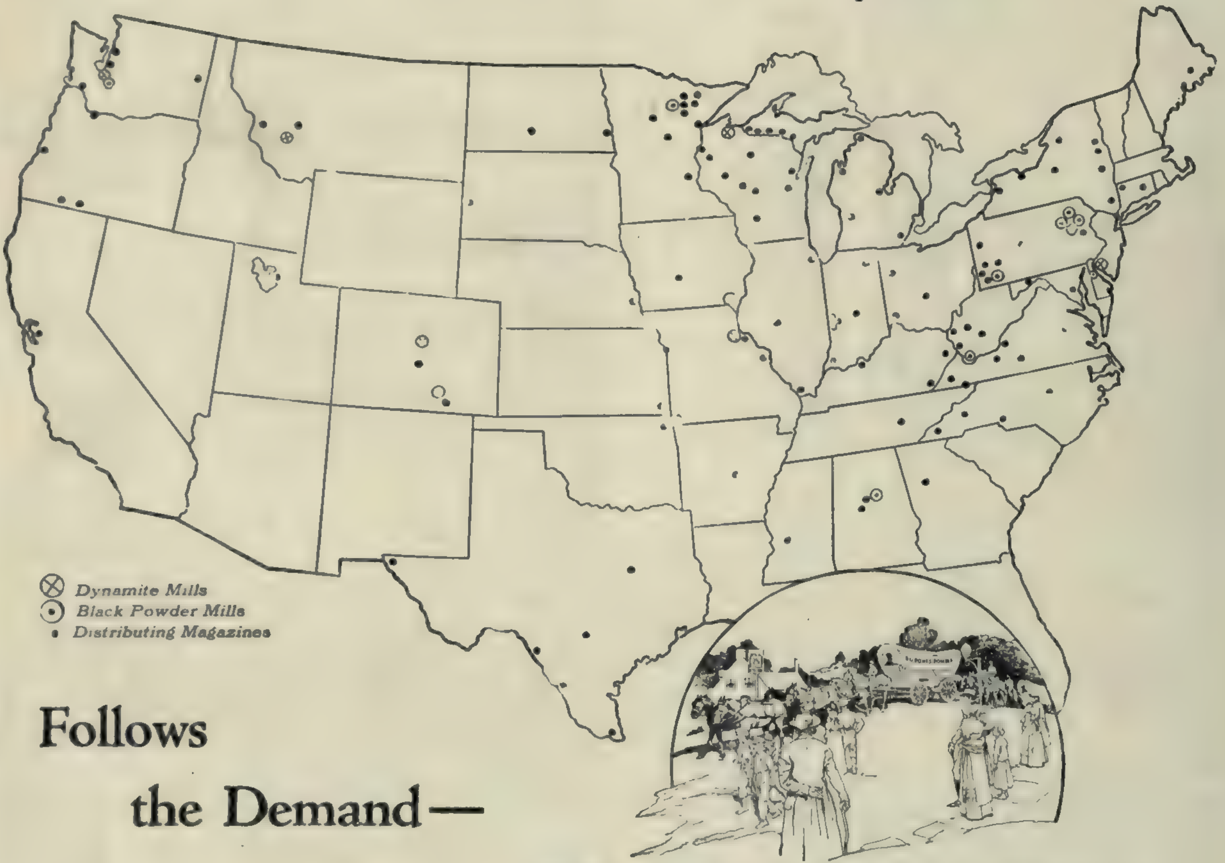

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THE HIGHWAY CONTRACTOR AND ROAD BUILDER

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NEW YORK, MARCH 10, 1920

Number
10

Maintenance of Completed Roads; the Keystone of Successful Road Development *

By PETER LEE ATHERTON

Fifteen, or even ten years ago, the pioneers in arousing public interest in good roads were called "road cranks," and politicians eyed them very suspiciously or shied away from them entirely. Today the "road crank" is a good road man; every man is a good road man; an no politician would make a speech on any subject that he didn't somewhere work in the sweeping statement that he was in favor of good roads everywhere for everybody.

So the fight for good roads, in the press and on the stump, in the broad public and political arena, has been won; or, in other words, the fight for good roads on paper has been won. But the fight for good roads on the ground—roads sceientificaly constructed and economcally and efficiently maintained—is just begun.

And especially is this true of the maintenance fight. Fortunately, this feeling is now very general over the country and the attention of all road men is being turned acutely to the solution of this maintenance problem. We have seen federal aid for highways and state aid for highways voted in millions. Many states have carried bond issues for road construction; counties have voted direct increased taxes, and road associations and individuals have made liberal subscriptions for road work But all, or practically all, of the money from these various sources has gone to construct new roads or to reconstruct old roads, and very little has been used for the maintenance of completed roads. Of course, I am more familiar with our own state than with other sections, and everything we have done in Kentucky has worked automatically to encourage construction and discourage maintenance; and, in a general way, I think this same condition exists more or less everywhere. Federal aid was to be met by state aid and applied through the state highway authorities, and these state powers could act only on the initiative of county fiscal courts or county supervisors. If one of our county fiscal courts was finally persuaded to devote enough county money to any one road to secure state and federal aid, it has always been with the intention, in many cases openly avowed, of not putting another dollar on this road until every other county road had received "its share" of county money, which meant until the surface of the reconstructed road was practically, and in many cases, entirely, destroyed.

These facts and figures—first, that 85% of the traffic of the country is, on the average, carried on 15% of the roads and, second, that probably 30 to 35% of the damage to road surfaces (certainly this is true of water-bound macadam and gravel) is due to the actual wear and tear, and 60 to 65% of damage is caused by the elements—these statements seem to have no weight whatever with the county authorities. Each magistrate or supervisor must take care of his district no matter what happens to the county as a whole—no matter how much federal, state and county money is wasted. And the sacredness of the Decalogue to the Christian, of the Koran to the Mohammedan,, of the teachings of Confucius to the Chinese, fade into insignificance compared to the devotion of the average countryman, especially in the South, to the magisterial fiscal court system. Voluntary county maintenance has proven to be a complete failure and will continue to be just so long as the magisterial fiscal court system, or some similar system, is adhered to, just as the best interest of education will suffer so long as the district school trustees' system is followed.

The ideal scheme of maintenance would appear to be some compulsory cooperative plan by which the state could work with the county, or at least where no state money would be given any county that did not adopt for, and apply to, any completed roads a consistent plan of patrol maintenance. This would stop the waste of county money from neglected maintenance, as well as of federal and state money. But there has been in the past, and there is still, to some extent, so much resentment on the part of the counties against "interference" by the state, even though state and federal monies have been expended in the county, that probably this compulsory and cooperative plan of maintenance, is, at this time, not practicable. In that case, the state must take over and carry on the maintenance of all roads into the construction of which any federal or state money enters. This seems to be the trend of present-day legislation, and, while it will not stop all waste, or even the greater part of it, there will be a start made in the right direction.

In every state the cities and larger towns pay a considerable and, in some states a very large, part of the taxes that go to road purposes and the taxpayers of the cities and towns are growing very restless under this continued and indefensible public waste of money.

It is entirely right and proper that the cities should contribute to the state road fund in amounts wholly disproportionate to the returns they get directly from the state road fund. The benefit to the city must and will come in the gen-

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*Paper presented at the 17th annual convention of the American Road Builders' Association, Louisville, Ky., Feb. 9-13, 1920.

eral building up of the state, this in time to be reflected by the increased prosperity of the city. But this indirect return from an improved road system can only be realized when through roads are properly built and economically maintained, and the continued, hearty cooperation of the taxpayers of cities can not be much longer expected unless a satisfactory scheme of maintenance is begun in the near future.

There are two phases of the maintenance question, one direct and one collateral, to which I would ask your attention for a few minutes and on which I would especially invite discussion.

First, if the idea is sound and could be adopted that, where roads are built with bond issues "construction" be understood to include grading of bed, drainage, permanent culverts and bridges, so far as they can be made permanent, and the metaled bed of the road proper which is to receive the road surface, of whatever material that may be, and that "maintenance" be understood to include the cost of the surface material and the cost of current continuous maintenance after the road is completed. The reason for such a differentiation between construction and maintenance would seem to be that a properly graded and drained road earthbed and a properly constructed road metal-bed—if the drainage is kept open and the metal-bed protected by a competent surface—are practcally indestructible. There are miles of old Telford base in this state in good condition, except where the shoulders have been for years exposed, that were laid nearly a century ago; and there are instances in Europe, too numerous to mention, where roadbeds have endured for hundreds of years. The life and usefulness of such road earth and metal-beds described above, project indefinitely into the future, and, this being true, it is only fair to distrbute the burden of such construction as far into the future as is financially practicable. This means longer term bonds and a smaller annual sinking fund requirement to retire these bonds. Sewer bonds have been issued in the City of Louisville for the construction of reinforced concrete sewers, these bonds to run 40 years, on the idea outlined above, i. e.. that as the future generations would get the benefit of money expended now it was only fair that these same generations should contribute their part to ultimately extinguish this debt. I believe 60 years the longest time for which any state has ever issued bonds, and, of course, there is a limit to the life of bonds beyond which the bond buyers would not be willing to go. Just what this limit really is I am not prepared to state, but every ten years added to the term of the life of a bond makes the yearly amount for sinking fund requirements that much smaller. Men familiar with bonds and bond dealings say they think a 60-year state bond could be sold practically as well as a shorter term bond. It would seem, if there is anything in the above scheme, that it would, to some extent, meet the objections so often voiced against bond issues running 20 or 30 years that we are assuming too much of the burden that should be borne by our succcessors.

The second and collateral phase of the maintenance problem I desire to present is this: In the desire to obtain money in different ways at this time for road construction, and especially for this idea of road maintenance, to which in the past so little money has been devoted, a strong tendency is appearing to levy——I might say indiscriminately—special taxes. One hears from different sources the idea advanced that as fast as the Government abolishes the special taxes which were levied in war times and for war purposes, the state puts on these same taxes for road purposes. One hears, also, the argument, or at least the statement, that a certain special tax is desirable because it will yield so much money, or that some other special tax is not to be considered, because it will not yield enough money with which to produce a certain result. Like all other road enthusiasts, I would like to see as much money devoted to roads as can be obtained by judicious and justifiable methods but I would like to ask if we are not in some danger of carrying this idea of special taxation—even for so good a purpose as road building and maintenance—too far. And then when we attempt to reason that a special tax should or should not be levied because of the amount of money such levy would produce, are we not losing sight of the real merits or demerits of the special tax question?

I believe it a conservative statement to say that the whole scheme of special taxation is one that has to be handled very carefully. The practice of shooting bills into the Legislature, putting a special tax on this or that commodity, or, in fact, on any form of propery, naturally forces the owners of such forms of property into the attitude of defendants. In other words, they are to be pronounced guilty by the Legislature if such a bill becomes a law and it is up to them to show that they are innocent. This is exactly the reverse of what it seems to me should be the true state of affairs. No form of property should be forced to bear a special tax unless there is some perfectly good and sufficient reason why it should be specially taxed. And the taxing authority that proposes to levy such a tax should carry the burden of proving such a tax justifiable instead of hailing before the legislative bar all kinds of property to show why such property should not bear a special tax. There is danger that many such bills, if this practice continues to grow, will be introduced purely for the purpose of inciting great efforts to have them withdrawn. Other such bills will be introduced with the idea of punitive taxation under the cloak of revenue taxation—that is, every man or a set of men who do not approve of the use of a certain thing, and they cannot legislate it out of existence, will try to tax it out of existence under cover of the statement that the state needs the money derived from such a tax.

Again as to the amount of money to be derived from the imposition of any special tax: Doubtless some kinds of special taxation are justifiable and wise. In such cases investigation narrows down to the amount or rate of special taxation that should be levied. This should be gauged in a spirit of fairness to the owners of the article taxed, when all things are considered, and the taxing body should be content to turn into its coffers whatever amount is realized by the imposition of this fair tax. When the list of articles to be speccially taxed has been completed by this method and the amounts to be raised by these taxes—whatever those amounts turn out to be—have been added together this sum should be accepted for what it is worth and added to the then present revenues of the taxing authority. The only point in this consideration to be watched is that no tax pays for itself that is so small that it costs more to impose and collect it than the net result.

When the amount derived from the imposition of fair and justifiable special taxes has been added to the then existing other revenues of the taxing authority and still more money is desired, this amount should undoubtedly be raised by increasing the general tax rate, and the fact that more money is still needed should not bring about an indiscriminate search for something to bear a new or increased special taxation, simply because more money is needed.

Lastly, the broad distinction should be borne in mind, wherever possible—and it is usually possible—that all kinds of current expenditures should be paid out of current revenues. If bonds are to be issued, the proceeds should be used only for work of the most permanent and enduring kind—certainly for work that will last much longer than the term of the bonds. There is a strong, and it would seem an entirely justifiable, opinion that current receipts from all forms of automobile license and gasoline taxes, where such are imposed, be devoted to the maintenance of roads instead of applied to the construction of new roads. The automobiles

(Concluded on page 140)

Factors Which Will Limit Highway Construction During the Coming Season*

Labor Saving Devices

By RICHARD HOPKINS

Contractor, Troy, N. Y.

Labor is so scarce and so unsatisfactory under our present industrial conditions and the highway program so large, that any suggestions that can be put forward to do a larger mileage of work in 1920 with the actual labor available are eagerly listened to by engineers and contractors engaged in road construction.

What has to be done can be done, and we all have our ear to the ground for ideas that can be whipped into shape to produce faster and better work. Important roads closed for construction will actually mean a loss of from $50 to $500 a day to the traveling public, so that highway officials are intensely interested in a contractor's plant and his methods, and will absolutely insist upon rapid construction. They will quickly discard non-essential details in specifications which hamper progress, and will critically study the contractor's plan of operations and help in every way they can to get a good job done quickly.

Nobody has made a deeper study of proper methods and proper machinery than manufacturers and their salesmen. At the present time they are in a position to advise the contractor, after an inspection of his job, as to the proper plant and the proper methods to use in the economical building of the job, and they are rendering a service that is being appreciated more every day.

The subject of "Labor Saving Devices" will be taken up under three headings—Grading, Asphalt Roadway and Concrete Roadway.

Grading

Jobs where the excavation exceeds 5,000 yd. per mile, and where a large proportion of the hauls are long, will generally call for a steam shovel. Where hauls are short and cuts small, scraper work will continue to hold first place. No grading job is complete without wheelers, drag-scrapers, fresnos, and at least one road machine.

Each of the three types of scrapers is more economical than either of the others under certain conditions, and for the small extra investment in plant it is foolish to be without at least a few of each one of the three kinds. Most contractors have in the past erred on the side of having their wheelers too large and their drag scrapers too small. The fresno of a 4-ft. width is the proper size for the average job. In case of shovel break-down, the teams can be put on scrapers until shovel is repaired. The road scraper is the most maligned and the most neglected grading tool we have. A good operator is essential, and with one, much good finishing work can be done cheaper than by any other method. There is a big range of sizes available, so it is an easy matter to choose the one best suited to the particular job.

It is advisable to carry rough grading and finished grading along together, as the latter can always be done more cheaply while the dirt is mellow. Specifications are growing more stringent in the matter of rolling in thin layers. This requires a big labor expense on the dump, especially with steam shovel work. A team on a 4-ft. fresno will take the place of 6 men on the dump, and spread the dirt evenly for the roller. In this connection, it is well to remember that, aside from a steam roller, nothing has been found that equals the compacting effect on a fill of horses tramping over it.

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In shallow cutting with a steam shovel on old macadam, it will generally be found best and cheapest to cut a few inches below grade, and dump every third or fourth dipperfull behind the shovel for the fine graders to bring the subgrade back to the correct elevation. Where a roller is fitted with a scarifier attachment, it is sometimes found that a lot of expensive hand work can be saved by its use. It is recommended that where the subgrading machine or planer is used between concrete forms, a steam roller be used to pull it. The roller is necessary for rolling the subgrade, and its use in pulling the planer dispenses with the need of providing a traction engine.

Asphalt Roadway

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No mechanical methods of spreading stone for macadam roads are recommended, as a man who knows how to spread stone can build a smoother road than can be gotten by any machine.

Concrete Roadway

Material Dumped on Subgrade.—By this method there is an average loss of about 5% on material, and where all the materials are high priced this becomes a very appreciable item at the end of the job. Where material is kept a long way ahead of the mixer, this material serves as a big stock eral building up of the state, this in time to be reflected by the increased prosperity of the city. But this indirect return from an improved road system can only be realized when through roads are properly built and economically maintained, and the continued, hearty cooperation of the taxpayers of cities can not be much longer expected unless a satisfactory scheme of maintenance is begun in the near future.

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*Paper presented at the 17th annual convention of the American Road Builders' Association, Louisville, Ky., Feb. 9-13, 1920.

There are two phases of the maintenance question, one direct and one collateral, to which I would ask your attention for a few minutes and on which I would especially invite discussion.

First, if the idea is sound and could be adopted that, where roads are built with bond issues "construction" be understood to include grading of bed, drainage, permanent culverts and bridges, so far as they can be made permanent, and the metaled bed of the road proper which is to receive the road surface, of whatever material that may be, and that "maintenance" be understood to include the cost of the surface material and the cost of current continuous maintenance after the road is completed. The reason for such a differentiation between construction and maintenance would seem to be that a properly graded and drained road earthbed and a properly constructed road metal-bed—if the drainage is kept open and the metal-bed protected by a competent surface—are practcally indestructible. There are miles of old Telford base in this state in good condition, except where the shoulders have been for years exposed, that were laid nearly a century ago; and there are instances in Europe, too numerous to mention, where roadbeds have endured for hundreds of years. The life and usefulness of such road earth and metal-beds described above, project indefinitely into the future, and, this being true, it is only fair to distrbute the burden of such construction as far into the future as is financially practicable. This means longer term bonds and a smaller annual sinking fund requirement to retire these bonds. Sewer bonds have been issued in the City of Louisville for the construction of reinforced concrete sewers, these bonds to run 40 years, on the idea outlined above, i. e.. that as the future generations would get the benefit of money expended now it was only fair that these same generations should contribute their part to ultimately extinguish this debt. I believe 60 years the longest time for which any state has ever issued bonds, and, of course, there is a limit to the life of bonds beyond which the bond buyers would not be willing to go. Just what this limit really is I am not prepared to state, but every ten years added to the term of the life of a bond makes the yearly amount for sinking fund requirements that much smaller. Men familiar with bonds and bond dealings say they think a 60-year state bond could be sold practically as well as a shorter term bond. It would seem, if there is anything in the above scheme, that it would, to some extent, meet the objections so often voiced against bond issues running 20 or 30 years that we are assuming too much of the burden that should be borne by our succcessors.

The second and collateral phase of the maintenance problem I desire to present is this: In the desire to obtain money in different ways at this time for road construction, and especially for this idea of road maintenance, to which in the past so little money has been devoted, a strong tendency is appearing to levy——I might say indiscriminately—special taxes. One hears from different sources the idea advanced that as fast as the Government abolishes the special taxes which were levied in war times and for war purposes, the state puts on these same taxes for road purposes. One hears, also, the argument, or at least the statement, that a certain special tax is desirable because it will yield so much money, or that some other special tax is not to be considered, because it will not yield enough money with which to produce a certain result. Like all other road enthusiasts, I would like to see as much money devoted to roads as can be obtained by judicious and justifiable methods but I would like to ask if we are not in some danger of carrying this idea of special taxation—even for so good a purpose as road building and maintenance—too far. And then when we attempt to reason that a special tax should or should not be levied because of the amount of money such levy would produce, are we not losing sight of the real merits or demerits of the special tax question?

I believe it a conservative statement to say that the whole scheme of special taxation is one that has to be handled very carefully. The practice of shooting bills into the Legislature, putting a special tax on this or that commodity, or, in fact, on any form of propery, naturally forces the owners of such forms of property into the attitude of defendants. In other words, they are to be pronounced guilty by the Legislature if such a bill becomes a law and it is up to them to show that they are innocent. This is exactly the reverse of what it seems to me should be the true state of affairs. No form of property should be forced to bear a special tax unless there is some perfectly good and sufficient reason why it should be specially taxed. And the taxing authority that proposes to levy such a tax should carry the burden of proving such a tax justifiable instead of hailing before the legislative bar all kinds of property to show why such property should not bear a special tax. There is danger that many such bills, if this practice continues to grow, will be introduced purely for the purpose of inciting great efforts to have them withdrawn. Other such bills will be introduced with the idea of punitive taxation under the cloak of revenue taxation—that is, every man or a set of men who do not approve of the use of a certain thing, and they cannot legislate it out of existence, will try to tax it out of existence under cover of the statement that the state needs the money derived from such a tax.

Again as to the amount of money to be derived from the imposition of any special tax: Doubtless some kinds of special taxation are justifiable and wise. In such cases investigation narrows down to the amount or rate of special taxation that should be levied. This should be gauged in a spirit of fairness to the owners of the article taxed, when all things are considered, and the taxing body should be content to turn into its coffers whatever amount is realized by the imposition of this fair tax. When the list of articles to be speccially taxed has been completed by this method and the amounts to be raised by these taxes—whatever those amounts turn out to be—have been added together this sum should be accepted for what it is worth and added to the then present revenues of the taxing authority. The only point in this consideration to be watched is that no tax pays for itself that is so small that it costs more to impose and collect it than the net result.

When the amount derived from the imposition of fair and justifiable special taxes has been added to the then existing other revenues of the taxing authority and still more money is desired, this amount should undoubtedly be raised by increasing the general tax rate, and the fact that more money is still needed should not bring about an indiscriminate search for something to bear a new or increased special taxation, simply because more money is needed.

Lastly, the broad distinction should be borne in mind, wherever possible—and it is usually possible—that all kinds of current expenditures should be paid out of current revenues. If bonds are to be issued, the proceeds should be used only for work of the most permanent and enduring kind—certainly for work that will last much longer than the term of the bonds. There is a strong, and it would seem an entirely justifiable, opinion that current receipts from all forms of automobile license and gasoline taxes, where such are imposed, be devoted to the maintenance of roads instead of applied to the construction of new roads. The automobiles

(Concluded on page 140)

Factors Which Will Limit Highway Construction During the Coming Season*

Labor Saving Devices

By RICHARD HOPKINS

Contractor, Troy, N. Y.

Labor is so scarce and so unsatisfactory under our present industrial conditions and the highway program so large, that any suggestions that can be put forward to do a larger mileage of work in 1920 with the actual labor available are eagerly listened to by engineers and contractors engaged in road construction.

What has to be done can be done, and we all have our ear to the ground for ideas that can be whipped into shape to produce faster and better work. Important roads closed for construction will actually mean a loss of from $50 to $500 a day to the traveling public, so that highway officials are intensely interested in a contractor's plant and his methods, and will absolutely insist upon rapid construction. They will quickly discard non-essential details in specifications which hamper progress, and will critically study the contractor's plan of operations and help in every way they can to get a good job done quickly.

Nobody has made a deeper study of proper methods and proper machinery than manufacturers and their salesmen. At the present time they are in a position to advise the contractor, after an inspection of his job, as to the proper plant and the proper methods to use in the economical building of the job, and they are rendering a service that is being appreciated more every day.

The subject of "Labor Saving Devices" will be taken up under three headings—Grading, Asphalt Roadway and Concrete Roadway.

Grading

Jobs where the excavation exceeds 5,000 yd. per mile, and where a large proportion of the hauls are long, will generally call for a steam shovel. Where hauls are short and cuts small, scraper work will continue to hold first place. No grading job is complete without wheelers, drag-scrapers, fresnos, and at least one road machine.

Each of the three types of scrapers is more economical than either of the others under certain conditions, and for the small extra investment in plant it is foolish to be without at least a few of each one of the three kinds. Most contractors have in the past erred on the side of having their wheelers too large and their drag scrapers too small. The fresno of a 4-ft. width is the proper size for the average job. In case of shovel break-down, the teams can be put on scrapers until shovel is repaired. The road scraper is the most maligned and the most neglected grading tool we have. A good operator is essential, and with one, much good finishing work can be done cheaper than by any other method. There is a big range of sizes available, so it is an easy matter to choose the one best suited to the particular job.

It is advisable to carry rough grading and finished grading along together, as the latter can always be done more cheaply while the dirt is mellow. Specifications are growing more stringent in the matter of rolling in thin layers. This requires a big labor expense on the dump, especially with steam shovel work. A team on a 4-ft. fresno will take the place of 6 men on the dump, and spread the dirt evenly for the roller. In this connection, it is well to remember that, aside from a steam roller, nothing has been found that equals the compacting effect on a fill of horses tramping over it.

The rotary grader has been on the market only a short time, but large capacity and cheap costs have been reported. It works rapidly in loam or gravel, and cuts accurately to grade. It also cuts old macadam readily, and a stone screening attachment can be provided if a contractor desires to save the old crushed stone. The old-time rooter plow and scarifier are tools that will always be used when a small amount of old macadam is encountered. Most plow companies now make a heavy moldboard plow with a narrow cut that is more successful in real hardpan than a rooter plow.

In shallow cutting with a steam shovel on old macadam, it will generally be found best and cheapest to cut a few inches below grade, and dump every third or fourth dipperfull behind the shovel for the fine graders to bring the subgrade back to the correct elevation. Where a roller is fitted with a scarifier attachment, it is sometimes found that a lot of expensive hand work can be saved by its use. It is recommended that where the subgrading machine or planer is used between concrete forms, a steam roller be used to pull it. The roller is necessary for rolling the subgrade, and its use in pulling the planer dispenses with the need of providing a traction engine.

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Penetration Work.—When the first penetration work was done the bituminous material came on the job in wooden barrels, was heated in a small kettle and poured on the stone with a small hand-pot. The great bulk of material at present arrives in tank cars, and is heated by steam. Roller and horse-drawn distributors are now on the market that apply the hot bituminous material at a high and uniform pressure and thus get a good, even penetration. Auto truck distributors with a central station are now located in various parts of the country, and a number of these will make deliveries at as great a distance as 40 mi. from the central station. During the past years the use of low-pressure steam for heating has been largely discarded, and high-pressure steam is being used on all new installations. It is possible to use an old low-pressure boiler and put a small super-heater between the boiler and the tank car and get fully as good results as are gotten with a high-pressure boiler.

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Concrete Roadway

Material Dumped on Subgrade.—By this method there is an average loss of about 5% on material, and where all the materials are high priced this becomes a very appreciable item at the end of the job. Where material is kept a long way ahead of the mixer, this material serves as a big stock pile placed where it is instantly available for the mixer. In these times of poor material deliveries, this subgrade method of storing finds many advocates because of being able to keep the mixer running. It is not a bad plan to have a few small stock piles of sand and stone scattered at various points along the edge of the road so that if the material at the mixer begins to run a little shy, a small amount of sand or stone can be brought in with a one-horse cart to meet this deficiency. The biggest disadvantage of stocking stone and sand on the subgrade is that the materials are hauled through fresh grading, and after a heavy storm it is difficult or impossible to get through for a while. Also, after a heavy storm a motor truck loaded with material will have a churning effect upon the subgrade. There are three methods of handling this material from the subgrade to the mixer.

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*Paper presented at the 17th annual convention of the American Road Builders' Association, Louisville, Ky., Feb. 9-13, 1920.

Wheel-Barrow Method.—With wheel-barrows, materials should be placed correctly so as to avoid both long wheeling and short wheeling. Short wheeling always makes a crowded and cluttered condition at the mixer and interferes with progress. All wheeling should be done on wooden run-ways. The mixer loader is a long conveying belt actuated by a gasoline engine. Above the belt are small hoppers into which the men shovel the material from the subgrade. This does away with the wheel-barrows, but not with the shovelers. One of these machines will save about 5 men. A self-propelling crane at the mixer will save about 12 men. With both the mixer loader and the crane the job is speeded up, and more batches per hour will be turned out than by the wheel-barrow method.

A movable bin at the mixer with a loading attachment has been suggested, but this is open to the criticism that material arriving at the bin in motor trucks must come in a fairly constant stream, as the capacity of a bin would be only a few batches and any delay in the transportation would mean a delay at the mixer.

Batch Transfer.—The batch transfer method saves from 75 to 80% of the men at the mixer. It is generally used in connection with industrial railway haulage, and each batch containing the proper amount of cement, sand and stone in a box or a car, is hoisted and dumped directly into the mixer. There can be no argument that this method results in less loss of material, avoids cutting of subgrades and allows more working days per month for concreting than any other method thus far tried. The original scheme of operating entirely by industrial track requires a length of track equal to the distance from the unloading point to the farthest point of the job.

Recently a plan, modified as to haulage, has been advocated by some manufacturers and contractors. It involves the use of 6,000 to 8,000 lin. ft. of track, with the necessary switches, cars and locomotives. The concrete mixer is started at the point nearest the unloading station, and approximately the first mile or mile and a half of the road is built by the industrial haulage method entirely. The portion of the track nearest the railroad station is then taken up and moved ahead and a temporary stock pile is made, or bins are set up at a point approximately 4,000 ft. away from the railroad station. Material is hauled to this point over the finished concrete road in motor trucks, and is then transferred to the batch boxes on the industrial railroad, and from this point on, the regular batch transfer method is followed. When another mile of road is completed, the position of the bins or stock pile is moved ahead to the farthest point of the concrete road which has had the necessary minimum time for curing. The application of this method results in the following:

The industrial railway haul is very uniform; the number of men required on trains and track remains the same, and the flexible part of the hauling is in the number of motor trucks used. The motor trucks can always be hired; they can work long hours, and the hauling cost per ton-mile over finished concrete roads is low, where there is only a small delay in time in loading and unloading.

The advocates of this method point out that while their costs include a second handling of material, their plant charges are very low compared with a regular system of industrial haulage. A contractor who has 5 mi. of track to build 5 mi. of road has half of his equipment idle when 2½ mi. of his road are completed, and 80% of his equipment idle when he has 4 mi. of his road completed. This modified method possesses the same advantage as entire industrial haulage does in the matter of grading, which is entirely away from the mixer and in no way interferes with it.

Central Mixing Plant.—Industrial engineers who are in the habit of placing thousands of yards of concrete from a central mixing plant are continually asking why a central plant is not used more in building concrete roads. A haul of 4 mi. by motor truck or industrial railway is possible before the concrete takes its initial set. Where water from a municipal supply is available and there is ample yard room at the unloading switch, a central mixing plant can be fed from overhead bins and a surprisingly low labor charge and plant charge per yard of concrete can be obtained.

Unloading Methods.—Wherever it is possible to do so, a trestle should be used for unloading. Frequently an existing trestle can be rented for a nominal amount and extended, if not already of large enough capacity. The economy of a short trestle is very much greater where the railroad company provides frequent switching service. Where only one switch a day is provided a trestle might be of doubtful economy, while the same trestle with two or three switches a day would be a very profitable investment. Bucket elevators run by gasoline engines and delivering to overhead bins continue to be a popular method of unloading. They of course require double the switch room of any other method. With a short switch track, frequent switching is a valuable help toward large daily capacity.

With both a bucket elevator and a trestle, battleship cars work better than any other type, and these are more easily obtained during the summer season than gondolas. A locomotive crane with a clamshell bucket can be used for direct loading, loading into overhead bins, loading on to a storage pile or on to a stock pile above a tunnel.

Water Supply.—In providing a water supply the essential requisites are continuous service, ample supply and good pressure. Dual pumping plants are the best insurance for a continuous service. Where there is a point of high elevation near the road, a storage tank of 1,500 to 3,000 gal. capacity is also a big help. Ample supply and good pressure cannot be maintained with a small pipe line. Inch-and-a-half pipe should be used only on short line with a heavy gravity head. The 2-in. pipe line is in almost universal use and is satisfactory where the line does not exceed 1 mi. in length.

Much better results on the average job will be obtained with a 2½-in. pipe line. Its use will become increasingly popular as construction men begin to appreciate how many of their pumping troubles disappear when this larger line is put into service. Where sources of supply are a long distance apart, booster pumps are necessary to provide good pressure.

In unloading bulk cement from a gondola car, a clamshell can be used. In unloading bag cement, two-wheeled hand carts will save one or two men.

Depreciation in Plant.—Where a plant is assumed to have a life of 5 years, a great many people are charging off 20% yearly. A more correct way is to charge off about 40% the first year, 40% of the remainder the second year, 40% of the remainder the third year, and so on until the end of the 5-year period.

In conclusion, there is no better way of saving labor and getting maximum efficiency out of the labor available than by either the contract or the bonus system. The reason for this is very simple—a man will work hard and intelligently when it is to his direct interest to do so. Good camps, with a little touch of the human side in their management, will bring both profit and satisfaction to their owners.

The Design and Construction of Different Types of Pavements*

Bituminous Macadam

By J. E. PENNYBACKER

Secretary, The Asphalt Association

Bituminous macadam came into prominence as a modification of the time-honored water-bound macadam highway, through the substitution of a bituminous binder for the water and rock dust which bonded the old type of macadam. The bituminous macadam type, because it retained the good points of the water-bound macadam and added the qualities of a well bonded and dustless surface, at very little more cost, and because it could be constructed with a minimum of equipment, has appealed strongly to thrifty road builders and taxpayers as a desirable type of pavement for country highways.

After some ten years of actual demonstration, there are today earnest advocates, and equally earnest critics, of this type of pavement, and each can point confidently to striking successes, and equally striking failures, respectively. To draw from successes and failures a knowledge of the underlying causes cannot fail to be helpful, for if we duplicate the causes of success, and avoid the causes of failure, we may reasonably hope for a satisfactory pavement as the outcome.

First, let me emphasize, however, the fact that this type like other types of surface, fails in many cases because of defective foundation and poorly drained subgrade. Such failures should be studied in connection with foundation and subgrade and should not be confused with the merits of the pavement itself. Bituminous macadam may be laid upon any type of foundation, and it requires first class drainage just as any type of highway requires it.

Massachusetts, Connecticut and Rhode Island have excellent examples of bituminous macadam. The latter state has this type on its main trunk line highways constructed in 1913, at an average cost of $1.09 per square yard and maintained at an average cost, estimated by the chief engineer, as less than $50 per mile per year. He states that in no case has maintenance cost over $100 per mile per year, while on one of the sections there has been absolutely no maintenance of the metal surface to date.

In view of such a service record, it is the part of common sense to seek an explanation first hand rather than to build upon theory, however sound. Mr. Patterson, the chief engineer, points to no fundamental changes in the type of construction as originally designed, but emphasizes certain faults which he found it necessary to avoid and certain qualities which he sought to attain. Thus, he pointed out as the fault most commonly noticeable in the bituminous macadam the waviness or corrugation of the wearing surface, and he ascribes five causes to which this is due, namely, (1) the use of asphalt of too high penetration; (2) excessive amounts of binder; (3) crushed stone of too small sizes in the wearing course; (4) soft stone in the wearing surface, and (5) inferior construction methods. That his conclusions were sound, the results he obtained have demonstrated.

Experience in New York State with the bituminous penetration type has covered a period of about 10 years, during which about 3,000 mi. have been constructed. Of this entire mileage only about 100 mi. or about 3⅓%, have been resurfaced, or reconstructed. Of about 730 mi. built in 1911 and 1912, 6.5% has been resurfaced or reconstructed—this shows that with an average age of 7 years, only a little over 7% was resurfaced or reconstructed. The maintenance costs during 1915, 1916 and 1917 averaged $464 per mile per year, including shoulder work.

Many of these roads were laid upon subgrades which were not adequately drained, and most of them were built to sustain a traffic far lighter in weight and smaller in volume than they have actually been called upon to sustain.

Turning again to Rhode Island experience we find remedial measures included substitution for the soft asphalt of an asphalt having a penetration of from 90 to 100.

The binding application of asphalt is made at the rate of 1.75 gal. per square yard of surface and the seal coat at the rate of between .75 and 1 gal. per square yard of surface, the quantities thus corresponding to the general practice of this type of surface.

Both Rhode Island and New York methods involve the use of crushed stone, in both the base course and the wearing course, of uniform sizes, passing a 2½-in. screen and retained upon a 1½-in. screen. The depth of the wearing surface is made 2½-in., after compression.

While Rhode Island uses trap rock, I would recommend that road building rocks which have the qualities of hardness and toughness in sufficient degree to render them suitable for water-bound macadam, but which lack cementing quality, may be used in this type. This quality, while essential in water-bound macadam, is not necessary where bituminous binder is used. Thus, hard granite, quartzite, hard sandstone and a good wearing quality of limestone, have been, and can be, used to advantage in this type of pavement. As a measure of suitability, it may be stated that in Brochure No. 6 of the Asphalt Association, attention is called to the fact that specifications frequently require the rock to show French coefficient of wear of not less than 7 when subjected to the abrasion test.

The striking success of the Rhode Island roads and the ability to withstand disintegration to the extent shown by the New York highways afford justification for a claim that, with careful attention to drainage, with adequate foundations, careful workmanship, and with the adoption of the specifications as to material and binder which have already produced successful results, the bituminous macadam type is easily entitled to be considered as standard.

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I shall not go into detail in the matter of construction methods, but would like to call your attention to Brochure No. 6 of the Asphalt Association entitled, "Asphalt Macadam," which sets forth our conception of the best theory and practice now prevailing in connection with this type of highway surfacing. Briefly, we set forth in the brochure the following salient points:

1. Foundations.—Broken stone foundations should seldom be less than 6 in. thick, and for heavy traffic should run from 8 to 12 in. in thickness. Warning is given that in utilizing old macadam for foundation base, test holes should be dug at frequent intervals to ascertain the true thickness of the old material. Old gravel roads as foundation are approved, except that where the gravel carries a high percentage of clay it cannot be depended upon to support heavy loads during the early spring north of the frost line, or where the subgrade is likely to be wet for a considerable period. It is recommended that where old, brick, block and concrete pavements are used as foundation, small depressions should first be filled with cold patch material. It is recommended that broken stone foundation be filled with screenings and made to approximate a finished macadam road as nearly as possible before laying the bituminous top course.

Mr. Fred W. Sarr, formerly in charge of maintenance of New York highways, tells me that his experience as to foundations leads him to suggest that foundations may be of gravel, macadam, telford, rough stone or cement concrete, depending upon soil and traffic conditions, with dimensions under average conditions 12 in. for gravel; 8 in. for macadam in two courses; 10 in. of rough stone and leveling course, and from 5 to 6 in. of cement concrete.

An interesting comment by Chief Engineer Patterson of Rhode Island on the foundation problem is, that while the bituminous surface ultimately is very nearly waterproof and has a tendency to keep the subsoil dry, the capillarity of certain subsoils is so marked as to make the waterproofing of the surface sometimes of little avail. In studying this characteristic of subsoils, the engineers make very careful examinations of conditions during a winter thaw, followed by an examination in the early spring when the subsoil is well saturated and when the frost is completely out of the ground. The Rhode Island practice is to employ a stone fill, avoiding telford as well as crushed stone, for the foundation proper. The stone foundations are constructed ordinarily of field, wall or ledge stone of sizes varying from 3 to 15 in. and the foundations vary in thickness from 6 to 18 in.

2. Asphalt Cement.—Application of asphalt cement may be made with hand-pouring pots or mechanical distributors, but in either case it is of vital importance that it be uniformly applied at the proper rate per square yard. In fact, uniformity in application is the first principle to be observed in bituminous macadam construction. Emphasis is made as to the necessity of sweeping from the surface of the foundation all excess dirt and fine material before laying the pavement.

Asphalt cement should be heated to a temperature between 275 and 350 degrees Farenheit. It is important to keep within these limits, because if the material is heated above the maximum named, the asphalt will harden and may be injured by coking and burning; if it is heated below the minimum named, proper penetration will be hindered or prevented and an excess will remain near the surface. The asphalt should be applied when the air temperature is perferably not less than 60 degrees Farenhiet.

The following table gives the penetration limits of asphalt cement as recommended by the Asphalt Association. The suggestion is made that where soft rock must be used, a relatively higher penetration asphalt than would otherwise be used is justified, the reason for this being, as the softer rock wears away, a tough mastic results:

	TEMPERATURE		
Traffic	Low	Moderate	High
Light	120-150	90-120	80-90
Moderate	90-120	90-120	80-90
Heavy	80-90	80- 90	80-90

3. Size of Stone.—While stone passing a 2-in. ring is recommended, the larger sizes, as used in the Rhode Island practice are perfectly proper, if compacted thickness is over 2 in. Stress is laid, however, upon the necessity for uniformity in sizes, as wide variation in sizes will result in spots which will prevent penetration of the bitumen. Attention is also called to the necessity for rolling the wearing course until there is a mechanical locking of the stone fragments. The fault is frequently one of under rolling rather than over rolling.

4. Construction Details.—Particular caution is given to apply the bitumen only when the entire depth of stone in the wearing course is thoroughly dry, and it is also urged that care be taken to prevent traffic from causing ruts, bumps or depressions. Where it is necessary to maintain traffic during construction, it is essential to delay traffic, after pouring until asphalt binder has cooled to air temperature.

Not all of our roads can be constructed of the so-called higher types, such as brick, cement, concrete, sheet asphalt and asphaltic concrete, and it is generally recognized that water-bound macadam is not suitable for motor traffic. As the difference in cost between water-bound macadam and bituminous macadam is not great, it would appear to be almost a duty that we devote such attention to this type as will insure its construction under the best possible conditions, so as to make highway funds go as far as possible. In these days of $40,000 a mile highways we must take stock and cut our garment according to the cloth or presently we may find the pendulum swinging in the other direction, through disappointment by the great mass of people at failure to obtain a mileage of highways sufficient to meet their traffic needs.

Michigan has Extensive Highway Program

Plans Call for Improvement of 1,350 Miles of Road—Contracts for Construction of 367 Miles of Trunk Line Roads Awarded—System of Road Patrol Under Organization

The Michigan road program calls for the building of 1,350 mi. of highway during 1920, according to F. F. Rogers, State Highway Commissioner. Already contracts have been let for the building of 367 mi. of trunk line roads, which will cost $4,600,000. Bids will be asked for 350 mi. of hard-surfaced highways, either brick or concrete, 150 mi. of macadam road and 300 mi. of gravel highway. The department has also contracted for the building of 240 mi. of federal aid highways.

A system of road patrol is being established, Commissioner Roger states, which will keep the roads in better condition than ever before. Through the maintenance engineer, recently appointed by the commission, it will be possible to devote more time to keeping the state award and trunk line roads in condition.

———OOO———

The Voters of the State of Alabama have ratified a bond isue of $25,000,000 for roads, according to a recent report from Montgomery.

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

Founded January, 1892

E. L. POWERS
Editor

T. A. HULBERT
Managing Editor

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Copy for advertisements must reach the New York office by noon on Tuesday of the week before date of issue if proofs are to be submitted.

Copy for classified and other advertisements where proofs are not required will be accepted until noon on Monday of the week of issue.

Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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Vol. XVIV MARCH 10, 1920 No. 10

THE NEGLECT OF MAINTENANCE

Most of those familiar with the conduct of road work will agree with much of what is said about the neglect of maintenance in the paper by Peter Lee Atherton, of Louisville, which is printed on other pages of this issue. At the same time, we believe, most of the close observers of the present trend in the highway field will testify to a very marked tendency toward improvement in the conditions criticized.

Probably much of the past neglect of upkeep was due to divided authority and responsibility. Until recent years, the duty of maintaining improved highways was largely laid upon the local units—towns, townships, districts or counties. Often different portions of a given length of road were supposed to be maintained by different authorities. Under such conditions there was naturally no uniformity of methods and no unity of purpose. Some sections of a road were well taken care of; on more the maintenance was poorly done; on many it was neglected entirely.

As soon as the states began to take over the work of maintaining the roads improved wholly or partly with state money—state and state aid roads in other words—conditions began to grow better. This practice is now common in many states; and in those states that have adopted it, we believe, maintenance is taken care of better than it is in those in which this work is left to the local authorities.

Though maintenance is taken care of much better now than it was a few years ago, there remain many questions to be answered in respect to both organization and methods. The financing of maintenance work also offers many opportunities for honest differences of opinion. For instance, in Mr. Atherton's paper it is stated that: "There is a strong, and it would sem an entirely justifiable, opinion that current receipts from all forms of automobile license and gasoline taxes, where such are imposed, be devoted to the maintenance of roads instead of applied to the construction of new roads." In an article by State Superintendent of Highways Bradt, of Illinois, printed in the issue of March 3, the use of such revenues for construction is strongly defended. This difference of opinion, however, may be more apparent than real since, according to Superintendent Bradt, the money from motor fees that is used for construction is only that remaining after meeting the cost of maintenance.

LABOR SAVING MACHINERY

A considerable part of this number of "Good Roads" is given up to matter concerning labor saving machinery—one which we believe to be of unusual importance at the present writing.

The outlook in the road building field has two disquieting features, one the shortage and high price of labor and the other the difficulty of obtaining materials There seems to be more money available for road building than there ever was before and plans have been made, and are still being made, for a record breaking year in construction. But it will be impossible to carry out these plans unless the road builders can find solutions of the labor and materials problems.

The labor difficulty can be overcome, in part of least, by the extensive and intelligent use of machinery. And there are many indications that this remedy will be tried on a large scale.

In former days, when labor was cheap and easily secured, the saving that could be effected by the employment of machinery was not so great nor so apparent. If a large amount of excavation had to be handled, a big gang of shovelers and a larg number of teams seemed to be—and frequently was—the cheapest outfit for doing the work. In many other operations the use of hand labor seemed to offer the cheapest and most available method. Now conditions are very different. Labor costs so much and is so difficult to obtain and so inefficient that a heavy investment in plant is often justified.

Makers of road machinery have kept pace with the demands for equipment for road work. New machines and improvements upon existing ones are being put on the market constantly, the best efforts of the manufacturers being devoted to the designing of machinery that will efficiently and cheaply perform the work required. Contractors and engineers are also paying more and more attention to this phase of their work, and the letting of larger and larger contracts is doing much to encourage the greater use of labor saving equipment.

In view of the existing conditions and those likely to obtain, it seems probable that the coming season will see a greater use of road machinery than ever before. And it seems probable, too, that once having adopted the use of plants comparable to those utilized in other kinds of large construction work, road builders will hardly go back to the hand labor methods of several years ago.

———OOO———

The Board of Supervisors of Livingston County, New York, passed a resolution at a recent meeting calling for an amendment to the state highway law, providing for the division of the automobile registration fees upon the old basis. Up to 1919, when the Legislature changed the law, 50% of the money collected in this way was paid into the county treasury and 50% into the state treasury. The amendment referred to, provided that 75% be paid into the state treasury and 25% into the county treasury.

Maintenance of Completed Roads; The Keystone Successful Road Development

(Concluded from page 134)

are certainly active agencies of wear and tear on roads, and it would seem entirely fitting that money raised from automobile licenses, or special taxes, should go to the maintenance fund. I am sure that automobile owners and users will submit more gracefully to a higher special tax if this plan is followed.

Any successful and continuous (and to be successful it must continue over a long term of years) scheme of road building depends upon a steady revenue for such purposes, and this steady revenue can only come from an army of reasonably contented taxpayers. And the slogan of the great army of taxpayers of this state, and I believe in other states from this time forward, will be: "Millions for funds against the mud, against natural, inevitable wear and tear on roads, but not one cent more as tribute to unnecessary and indefensible waste."

Governor Smith of New York Fights Cut in Highway Appropriation

Opposing the proposed action of the majority party in the New York legislature to cut in half the recommendation of $15,000,000 for road maintenance for the coming year, Governor Smith issued a long statement on March 2, predicting disaster to the state highways if money were not provided to maintain them. An article by H. E. Breed was cited, which showed that $7,500,000 expended on road work this season would not bring the results that $4,000,000 did a few years ago, and that if the recommendations of State Highway Commissioner Greene were cut in two, less work could be done than in any year since 1914.

Plans to Build "Ideal" Road

Lincoln Highway Association Seeking the Cooperation of Road Builders in Building Section of Highway to Serve as Model for the Heavy Traffic Highway of the Future

A tentative plan for the construction of an "ideal" section of road by the Lincoln Highway Association was laid before the American Road Builders' Association at its recent convention at Louisville by Austin F. Bement, Vice President and Secretary of the Lincoln Highway Association.

In explaining the association's proposed action, Mr. Bement said that the construction of such a section had been considered by the directors of his organization and that they were anxious to obtain the benefit of the advice of road builders throughout the country. The association has been guaranteed sufficient funds to carry out the work by the U. S. Rubber Co., through its president, J. N. Gunn, who was recently elected to the board of directors of the association. It is hoped to carry out the plan during the present year.

The location of the section has not yet been decided upon, but according to Mr. Bement it "will be placed at some point easily available to the majority of those interested in the study of adequate highway construction and where it will be seen by the greatest volume of traffic on the transcontinental road and easily available for inspection by those traveling north and south." The final specifications, he said, will probably call for a paved width of not less than 32 ft. on a 100-ft. right of way, thus providing for sufficient room for two lines of heavy freight traffic and two lines of faster passenger traffic. The ditches would be covered, the road would be lighted and the outer 18 to 20 ft. on each side of the right of way would be beautified with trees and shrubs.

Fight Against Pennsylvania Bond Issue Abandoned

The suit brought by the Short Line Land Co. to prevent the State of Pennsylvania from borrowing $50,000,000 for road construction has been withdrawn.

As noted in "Good Roads" of Feb. 18, this suit was brought to prevent the issuance of the road bonds voted by the people of the state at the 1918 election

New Jersey Governor Criticizes State Highway Deparment

Urges Building of the Interstate Tunnel Between New York and New Jersey and Asks Delay in Appropriations for Highway Work

Urging the building of the interstate traffic tunnel under the Hudson River betwen New York and New Jersey and admonishing the Legislature not to devise means at this time of raising money to carry on the work of completing the state highway system, Governor Edwards, of New Jersey, in his message to the Legislature on March 1, scored the methods and policies of the New Jersey State Highway Department.

In 1917 the "Edge Act" was passed providing for the paving of fifteen main routes, said the Governor, and also a companion bill, the "Edge Road Tax Act," which provided for a tax of one mill for each dollar of personal and real property in the state. It was argued that this revenue would provide substantially $15,000,000, which, with federal aid money amounting to approximately $3,000,000, would be sufficient to complete the highway system called for by the law.

Immediately after the passage of this act the State Highway Department made a survey of the routes and prepared an estimate, which, according to the Governor, showed that the highway system would cost $38,667,800 under the costs prevailing at that time. So far, contracts for 236 mi. of highways have been awarded at a total cost of $11,884,678, and the money collected or to be collected under this act up to July 1, 1922, totals $18,265,844, which leaves a balance of $6,381,166. There remains to be completed, continues Governor Edwards, 419 mi. of highways which, it is estimated, will cost $37,140,000, leaving an amount of $30,738,854 required to complete the present system of highways.

"A simple computation," says Governor Edwards, "indicates that the cost of the highway system, instead of being $15,000,000, will, when completed, be approximately $42,000,000, or nearly three times as much as was represented to the people when the 'Edge Road Act' of 1917 was passed."

OOO

Appropriations for Road Work in Canada total $100,000,000, according to a statement by G. A. McNamee, Secretary of the Canadian Good Roads Association.

An ordinance has been introduced in the Common Council of Pitsburgh, Pa., providing for a $1,140,000 bond issue for the construction of a thoroughfare to be known as the Boulevard of the Allies. The proposed boulevard will extend from Grant St. and Second Ave. along the bluff to Craft Ave.

The New Jersey State Highway Commission has written a letter to Governor Edwards, urging that the entire state highway system be placed under its control. The letter also states that, if the motor vehicle fund is left intact for road repair and construction, the Commission can maintain the entire state highway system of 652 mi. of roads in a satisfactory manner, besides granting substantial sums to counties for the repair of county roads.

EQUIPMENT—TRADE—MATERIALS

Motor Truck with Blower Attachment for Cleaning Streets

A somewhat novel street cleaning device used in the City of Pasadena, Cal., is shown in the accompanying illustration.

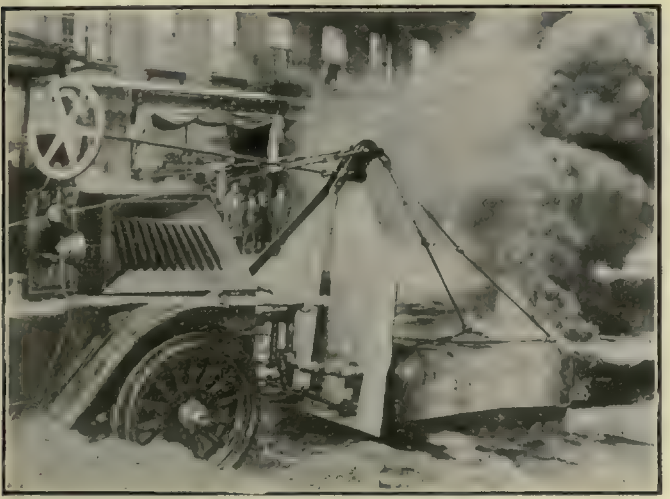
The machine consists of a Sturtevant blower, a steel container and a 4-cylinder gasoline engine, mounted on a motor truck equipped with brushes. The brushes loosen the dirt which is collected by the blower, driven by the engine mentioned, and discharged into the steel container.

MOTOR TRUCK WITH STURTEVANT BLOWER USED IN STREET CLEANING

Snow Melting Attachment for Motor Trucks

The unusual amount of snow and ice on city streets during the past weeks has brought out many new types of snow removal apparatus. One of the most novel of these is shown in the accompanying illustration.

The apparatus consists of an oil burner attached to a motor truck, the machine shown in the accompanying illustration being a 7½-ton Mack. The apparatus was invented by L. V. Stevens, a Canadian engineer, and was first used by the Canadian Pacific Railroad to clear its tracks. The truck carries a 1,800-gal. tank of crude oil and travels at the rate of 5 mi. per hour. The oil and air are forced ahead under compression through a mixer or carbureter to the burners, the method being similar to that used in the burners of blast furnaces and oil burning locomotives.



SNOW MELTER IN OPERATION

The illustration shows the apparatus being demonstrated in the Buorugh of Brooklyn, N. Y.

Novel Snow Cleaning Device

The recent period of heavy snow storms in New York City brought out some strange snow removing devices. One piece of snow removing machinery which attracted considerable attention was a 20-ton truck equipped with mechanism which enabled it to eat its way into a snow drift. The snow is drawn up into a specially designed body of the truck and then ejected dwon a chute into the gutter, as seen in the accompanying illustration, or into another truck running alongside.

NOVEL SNOW REMOVING DEVICE

It is stated by the National Snow Removing Co., owners of the truck, that this machine is capable of removing 9 cu. yd. of snow a minute and is able to do the work of 1,000 men in a single day. It is also stated that it will travel 5 mi. an hour in 3 or 4 ft. of snow, clearing a space 11 ft. wide and throwing the snow a good distance from the truck. The machine is mounted on 40x12 United States solid tires, each of which is designed to carry a weight of 5 tons.

F. C. Austin Company Absorbs Lindeman Steel & Machinery Company

The F. C. Austin Machinery Co. has been incorporated to take over the entire business of the F. C. Austin Co., Inc., the Municipal Engineering & Contracting Co. and the Muskegon plants of the Linderman Steel & Machinery Co. The new company will retain the personnel of the merged companies whose combined efforts will now be directed towards supplying the demand for Austin machines.

The combination of the Austin and Linderman plants increases eightfold the capacity of the present Austin Company and gives this new company, it is reported, the largest capacity for earth loading and cement working machinery in this country.

F. C. Austin retires from the active management and B.

A. Linderman, President of the Linderman Company, will assume control. The offices of the combination will remain in the Railway Exchange Building, Chicago.

Self Heating Asphalt Smoothing Iron

A new type of asphalt smoothing iron which is self-heating has been designed by the Hauck Manufacturing Co., of Brooklyn, N. Y. A tank of 1½ gal. capacity is attached to the handle and supplies kerosene to the burner which heats the iron.

As shown in the illustration, the heating chamber is in the iron proper. The handle carries the fuel tank equipped with hand pump and gauge and a Hauck kerosene burner having an oil needle valve and strainer. The burner is set before the opening to the chamber in the iron through which the flame enters.

SELF HEATING ASPHALT SMOOTHING IRON

The tool weights 60 lb. and does not have to the lifted from the asphalt until the work is completed The fire wagon and the carrying of the iron back and forth are eliminated and, it is stated that the fuel costs are considerably lower than with other methods.

Annual Convention of Chain Belt Company Representatives

The annual convention of the Chain Belt Company's mixer sales representatives was held in Milwaukee, Wis., on Jan. 19, 20 and 21, with about 100 distributors of Rex mixers and pavers in attendance.

Included in the program were meetings at the Milwaukee Athletic Club, visits to industrial plants, sales demonstrations, entertainments and exhibitions and demonstrations of Rex mixers and pavers at the company's new plant in West Milwaukee.

The sessions were presided over by C. F. Messinger of the Chain Belt Co., and discussions were led by B. F. Devine, S. Shafer, Jr., J. W. Millspaugh and A. E. Miller, of the company, and K. B. Noble and M. R. Hunter of the distributors. The discussions included talks on road construction methods, service to contractors, advertising, manufacturing processes and ways and means of securing construction business.

It was announced that the company's new building, with an area of 47,000 sq. ft. for the exclusive manufacture of concrete mixers and pavers, would be ready for operation about March 1. This is the first unit of an extensive building program which will eventually mean the removal of the entire Chain Belt plant to West Milwaukee. This program of extension follows the recent increase in Chain Belt Company's capital from $1,000,000 to $2,000,000.

The annual banquet was held on Jan. 20, with about 175 distributors, members of the company and guests in attendance. The speakers included C. E. Bement, President of the Novo Engine Co.; Lloyd Maxwell, of the Erwin & Wasey Co., and H. O. Seymour, Vice President of the First Wisconsin National Bank, Milwaukee.

National Steel Fabric Company Purchases the Highway Materials Department of the H. H. Robertson Company

The H. H. Robertson Co., of Pittsburgh, Pa., has announced that its Highway Materials Department has been purchased by the National Steel Fabric Co., of Pittsburgh, Pa., and that the balance of all unfilled fabric orders will be shipped by the latter firm.

Correspondence relating to past contracts or new business, it is further announced, should be addressed to the National Fabric Co., First National Bank Bldg. E. L. Benedict, formerly Manager of the Highway Materials Department of the Robertson Company, is vice president and manager of sales of the National Steel Fabric Co.

It is also announced that the service rendered through the Robertson data book will be carried on by the National Steel Fabric Co. as the National data book service.

Asphalt Association Establishes Headquarters in New York City

Permanent headquarters for the Asphalt Association, an organization representing the producers and users of asphalt for paving purposes, have been established in the new National Association Building, 25 W. 43rd St., New York, N. Y.

From its main headquarters and its branch offices at Washington, Chicago and Toronto, the association will continue its educational and research work, looking to the extension and development of asphaltic types of highway construction along the most effective engineering and economic lines.

J. R. Draney, of the United States Asphalt Refining Co., is president of the association; W. W. McFarland, of the Warner-Quinlan Co., is vice president; Herbert Spencer, of the Standard Oil Co., of New Jersey, is treasurer, and J. E. Pennybacker, formerly chief of management of the United States Bureau of Public Roads, is secretary of the association.

A feature of the activities of the association is a brochure series explaining the approved methods of constructing asphalt macadam, asphaltic concrete and sheet asphalt pavements, and presenting information as to asphalt specifications and the use of asphalt fillers for brick and block pavements. Lectures in universities and colleges have been given or arranged for, in about 25 of the leading educational institutions of the United States and Canada.

The Lakewood Engineering Co., of Cleveland, Ohio, has opened a district sales office at No 413 Times-Dispatch Building, Richmond, Va. The office, which will serve the Virginia and North Carolina territory, is in charge of F. W. Truex, District Manager, and C. F. Bright, Sales Engineer.

In order to take care of the growing business along the Pacific Coast and northern Mexico, the Jeffrey Manufacturing Co, has opened a new branch office in Los Angeles, Cal. F. R. Field, who has been manager of the Denver office, will be in charge of the new office. Mr. Field is well known and and has a large following of friends in the West and is especially fitted to direct the extension of the company's business in this territory.

The Atlantic Refining Co. of Philadelphia, Pa., has recently been awarded a verdict of $60,054 against the Erie Forge & Steel Co., in a case tried before Judge Rossiter in Erie County, Pennsylvania. The suit was based on an oral contract to deliver fuel oil. The defense was, first, that the oral contract had not been entered into, and second, that it had been nullified by a commandeering order given on the date of the alleged contract.

The Barber Asphalt Paving Co. has recently issued two circulars which depart from the stereotyped style of catalog. One is similar in form and appearance to a time table with tables of statistics of kinds of asphalt used in Buffalo, N. Y., since 1879, and maintenance figures on asphalt in Washington, D. C. The second folder, hearing the title "Once in a Blue Moon," describes the new Iroquois macadam roller. This machine was illustrated and described in "Good Roads" for Feb. 4.

The North Texas Stone Co., has changed its name to the Lone Star Stone Co., and, it is reported, will open its quarry at Chico, Texas, about April 1.

The Easton Car & Construction Co., of Easton, Pa., has opened a branch office in Room 40, Penobscot Building, Detroit, Mich., for the purpose of giving better service to customers in the Detroit district. The office is in charge of H. H. Siff, District Sales Engineer, who has had wide experience in the industrial railway line and whose services are at the command of those interested. The Easton Company announces that a stock of spare parts will be carried in the Detroit branch as soon as the demand for such service makes it advisable.

MEETINGS

Calendar of Coming Meetings

Apr. 12-17—United States Good Roads Association—Eighth Annual Convention, Hot Springs, Ark. Director General, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

Apr. 16-17—Bankhead National Highway Association—Fourth Annual Convention, Hot Springs, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

Texas Roadbuilders Association

The first meeting of the Texas Roadbuilders Association was held at the Driskill Hotel, Austin, Texas, on Wednesday, Thursday and Friday, Feb. 18, 19 and 20. Sessions were held in the morning and afternoon of each day On Thursday evening there was an illustrated lecture by a representative of the Lakewood Engineering Co., and on Friday evening a meeting was held for perfecting the organization.

The meeting was opened on Wednesday forenoon with State Highway Engineer Rollen J. Windrow presiding. The address of welcome was given by Governor W. P. Hobby, of Texas, and was followed by an address by Chairman R. M. Hubbard, of the State Highway Commission. The remainder of the session was devoted to reports on work by the division engineers of the State Highway Department, and an address by C. N. Fowler, Member of the State Highway Commission, on "Future Federal and State Participation in Highway Construction."

At the afternoon session on Wednesday the following papers were presented: "Relation of Federal Bureau of Public Roads to State and Federal Aid Projects," by J. D. Fauntleroy, District Engineer, U. S. Bureau of Public Roads; "Relation of State Highway Department to State and Federal Aid Projects," by C. H. Kendall, Assistant State Highway Engineer of Texas; "State and Federal Aid Projects from Contractor's Viewpoint and Suggestions for Betterments," by G. C. Hawley, of the Texas Bithulithic Co. A paper on "Relation of Counties to State and Federal Aid Projects; Present Conditions as to Cooperation and Suggestions for Betterments," which had been assigned to A D. Duck, was presented by F. E. Hess, of Dallas. Other addresses were made by Newman B. Gregory, Arthur P. Denton, of the Portland Cement Association, and A. R. Young of The Texas Co.

On Thursday morning Col. Ousley, of the Board of Criminal Appeals, made an address upon the necessity of good roads and the roads of France. C. N. Avery, Member of the State Highway Commission, presented a paper "Misunderstanding Concerning Functions of State Highway Department," and T. R. Spence, Superintendent of Equipment and Maintenance, State Highway Department, spoke on "Federal Equipment—the Handling by the State after its Receipt; Organization Methods."

Papers of the afternoon session on Thursday were: "Desirability of Building more Permanent Types of Roads," by R. V. Glenn, Consulting Engineer of Tarrant County; "Surveys and Plans—Present Methods of Preparation and Recommendations for Betterments," by Julian Montgomery, County Engineer of Rockwall County; and "Drainage Problems and Designs of Modern Highway Drainage Structures," by G. G. Wickline, Bridge Engineer of the Texas State Highway Department.

At the session on Friday afternoon the following papers presented: "Road Materials—State's Relation to Location and Development of Sources and Transportation," by T. H. Webb, Engineer of Materials and Tests, Texas State Highway Department; "The County Engineer," by Terrell Bartlett of San Antonio (read by Mr. Wickline in Mr. Bartlett's absence); "Road Materials—Testing and Grading," by R. G. Tyler, Associate Professor of Highway Engineering, University of Texas; "Special Construction Features," by W. O. Washington, of Whiteaker & Washington, San Antonio.

At the session on Friday afternoon the following papers were presented; "Aggregate and Methods of Preparing Concrete Mixtures," by F. E. Geisecke, Chief Division Engineer, Bureau of Economic Geology and Technology, University of Texas; "Making Concrete for Highway Pavements and Bridges," by L. H. Edwards, Senior Highway Bridge Engineer, U. S. Bureau of Public Roads; "Topeka Pavements," by R. M. Green, Professor of Highway Engineering, Texas Agricultural and Mechanical College; "Bituminous Surface Treatments," by M C. Welborn, Division Engineer, Texas State Highway Department; "State Organization for Highway Maintenance," by R. J. Windrow, State Highway Engineer; "County Organization for Highway Maintenance," by Manton Hannah, County Engineer of McLennan County, Texas.

At the organization meeting on Friday evening it was decided to hold meetings semi-annually, one to be at Austin and the other at a place selected by vote of the members. An invitation to hold a meeting at Waco was extended by County Engineer Hannah of McLennan County, and was accepted. The date will be announced later.

Officers for the coming year were elected as follows: President; R. J. Tyler, Associate Professor of Highway Engineering, University of Texas; Vice President for North Texas, R. V. Glenn, Consulting Engineer of Tarrant County, Ft. Worth; Vice President for South Texas, L. W. Kemp, of The Texas Co., Houston; Vice President for East Texas, N. B. Gregory, Contractor, Texarkana; Vice President for West Texas, E. M. Overshiner, County Judge of Taylor County, Abilene.

Four directors, one to be an engineer, one a contractor, one a material man and the other a county official, were elected as follows: J. C. Nagle, Dean of Engineering Department, Texas Agricultural and Mechanical College, engineer; R. J. Potts, of Potts & Prentice, Waco, contractor; E. L. Dennis, Jr., of the Texas Trap Rock Co., San Antonio, material man; and Cecil L. Simpson, County Judge of Dallas County, Dallas, county official.

The League of Texas Municipalities will hold its eighth annual convention at Dallas, Texas, on May 13, 14, and 15.

The twelfth annual convention of the North Dakota Society of Engineers was held on March 10 and 11 in the city hall at Grand Forks, N. D. On the afternoon of March 10, the subject of highways and bridges was taken under consideration, with W. H. Robinson, of Bismarck, as chairman of the committee.

The American Concrete Pipe Association held its annual convention on Feb. 20 and 21, 1920, in Chicago, Ill. A. N. Shearman, of Knovxille, Tenn., was elected president and Ernest Bent, of Los Angeles, Cal., Harry K. Cain, of Mankato, Minn., and A. M. Hirsh, of New York, N. Y., were elected vice presidents.

PERSONAL MENTION

A. S. McMaster has been appointed city engineer of Paris, Texas.

E. R. Bowie has been appointed county engineer of Uvalde County, Texas

J. W. Benjamin has been appointed county engineer of Gonzales County, Texas.

W. Steinberger was recently appointed county engineer of Jackson County, West Virginia.

H. W. Holmes has succeeded F. E. Phillips as bridge engineer of the Montana State Highway Commission.

Fred P Holt of Mexia, Texas, has been appointed road engineer of several districts in Limestone County, Texas.

Harry R Hayes, Commissioner of Public Works of Utica, N. Y., will enter private practice as manager of Hayes Engineering Service, Utica.

H. L. Riley, of Minneapolis, Minn., has been detailed as resident engineer of Shiawassee and Clinton Counties by the Minnesota State Highway Department.

Hess & Skinner, consulting engineers of Dallas and Amarillo, Texas, have been appointed county engineers for Hartley, Cottle, Childress and Briscoe Counties, Texas.

James F. Platt has been appointed bridge engineer of the Wyoming State Highway Department. It was incorrectly stated in "Good Roads' for Feb. 11 that Mr. Platt has been appointed chief enginer of the department.

George S. Webster has been appointed chief engineer of the Bureau of Surveys, Department of Public Works, Philadlphia, Pa., following the expiration of his term of office as director of the Department of Wharves, Docks and Ferries.

Edward P. Lupfer, of Buffalo, N. Y., has been appointed a member of the Buffalo Public Bridge Commission which was created by Congress to investigate and report on the building of an international bridge over the Niagara River near Buffalo.

OBITUARY

Edward E. Goff, for the past five years city engineer of Cranston, R. I., died recently. Prior to being city engineer, Mr. Goff had been employed by the N. Y., N. H. & H. R. R. R.

J. L. Miller, at one time coutny engineer of Ross County, and later city engineer of Chillicothe, O., died Feb. 14, following injuries sustained from a fall. At the time of his death, Mr. Miller was in charge of the construction of a large project of the Meade Pulp & Paper Co., of Chillicothe.

Senator John H. Bankhead, of Alabama, died recently after long service in Congress, as a representative and as a senator Senator Bankhead was Chairman of the Senate Committee on Post Offices and Post Roads and was very active in advocating federal aid to the states in road building, having been the author of the original federal aid road act.

Andrew C. Hansen, City Engineer of Los Angeles, Cal., died recently in his home in that city of pneumonia. Mr. Hansen was born in Denmark in 1880, coming to this country with his parents while very young. In 1906 he was put in charge of the outfall sewer being built for Los Angeles and successfully completed the work after it had been abandoned by the contractors In 1913 he was made chief deputy city engineer and in 1917 was appointed city engineer.

———OOO———

Proposing a National System of Motor Truck Defense on the West Coast, Representative Raker recently introduced in the House a bill authorizing examination, survey and report by the War Department as preliminary to improvement, construction and maintenance of such system.

Claims Against New York State, amounting to $40,440 have been filed in the State Court of Claims by Henry P. Burgard for increased cost of labor and materials on highway construction work on the Cape Vincent-Clayton Road, Jerferson County, and claims for $8,518 have been filed for work on the Gunn Corners-Fischer's Landing highway in the same county.

A Contract for Road Building in Westmoreland County, Pennsylvania, on State Highway No. 188, between Shearersburg and Arnold Borough, a distance of approximately 38,433 ft., was recently awarded to the State Construction Co., of Kensington, Pa., at $446,451.05. The type of construction is to be one-course reinforced concrete and hillside vitrified brick and the surface of the road is to be from 16 to 18 ft. wide.

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

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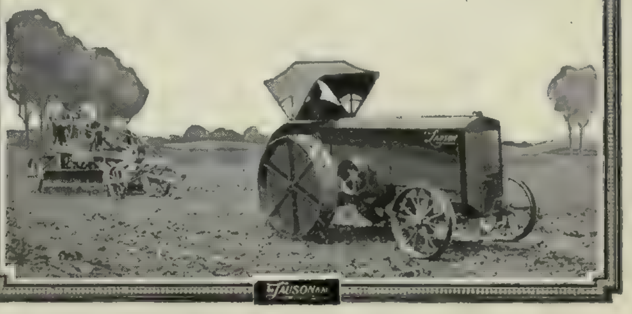

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CONSTRUCTION TRANSPORTATION MAINTENANCE

WITH WHICH IS INCORPORATED

THE HIGHWAY CONTRACTOR AND ROAD BUILDER

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NEW YORK, MARCH 17, 1920

Number
11

Relation of the Highway Engineer to Successful Road Location, Construction and Maintenance[*]

By T. F. HICKERSON[†]

The time has arrived when arguments as to the advantages of good roads are rarely heard. In fact, people generally are keenly desirous of better roads immediately, even at great cost. The road building program in the United States for the year 1920 exceeds that of any other known engineering project. About $750,000,000 is said to be available for road improvement. Probably five times as much money will be spent on roads during this one year as was necessary to build the entire Panama Canal.

The most difficult problem in road building now is not how to finance roads but how to build them fast enough to please the public. There is danger in too much haste about building roads that must stand the requirements of traffic and satisfy posterity. Numerous experiences of the past have demonstrated beyond all doubt, even to the layman, that roads should be laid out and built and kept in good condition according to a plan. Any well executed plan requires skill and time.

The highway engineers and officials in this country are facing a tremendous responsibility. There can be no guarantee of a wise expenditure of this vast fund without the freest application of scientific, non-political methods. Engineers must have ample time and opportunity to investigate and plan thoroughly all the important features of roads that are to be built and kept up, so that whatever is done will be done in a thoroughly scientific manner.

A few days ago, there appeared an article in one of the papers from a North Carolina county that is entering upon an extensive road building program, congratulating itself that the county had no improved roads whatsoever and therefore no bad investments. It is paradoxical, of course, to say that any county without roads is fortunate, but this county does have the advantage of profiting by whatever mistakes have been made by other counties.

One of the greatest contributions of the Federal Government in connection with its aid to road building has been the rigid requirement for thorough engineering and the creation of state highway departments whose aim it is to work in conjunction with the Bureau of Public Roads and the various counties in planning and laying out a permanent road system.

In no phase of road improvement is the work of the engineer more important than in the location, because this is the only permanent feature. Numerous mistakes have been made in the past due to shortsightedness in the layout of roads. Some of these errors will never be corrected and others only at enormous expense. Before proceeding with the exact location, more attention should be paid to preliminary investigations for traffic conditions and the relation that the road in question bears to the road system. There may be several dozen considerations which exert more or less influence on the location, but the primary technical considerations are distance, avoidance of sharp curves, drainage and grades.

In hilly and mountainous country, grades are the first considerations are distance, avoidance of sharp curves, draintion was paid to grade reduction; directness was the only consideration. On soil roads it is highly desirable that no grade exceed 4%. As the grade increases beyond 4%, transportation becomes burdensome and the washing of the soil due to the increased velocity of the surface water begins to show marks of destruction. From the standpoint of maintenance, grades steeper 4%, or at most 5%, are very objectionable, since the tendency is for the water to cause little gullies across the road surface and make the side ditches wider and deeper.

During the past five years, automobile and motor truck traffic has reached the degree of intensity and recklessness where safety to life demands the elimination of sharp curves to the greatest possible extent. It is desirable that curves shall be flat enough to allow an unobstructed view of 300 ft. ahead so that motor vehicles can pass each other safely at high speed. This question of better alignment will undoubtedly receive more attention in the future than in the past. The curves of a highway should be laid with instrumental precision and never any more with the eye in a hit or miss fashion, as has sometimes been the case.

If funds are limited, the engineer must decide where technical requirements should be retained and where ignored; but he must plan the work so that whatever is done will become a useful part of any future improvement. In most of the counties in North Carolina, and I presume conditions are similar in South Carolina, funds are only sufficient to build a sand-clay or topsoil road, which may have to be changed to a hard-surfaced road in a few years to meet the demands of traffic. A road of this type should be located and designed with the same degree of care as the highest type of pavement. It should be permanently established with the best possible alignment, the easiest graded that the topography will reasonably admit, the best drainage structures, and a good safe width. In fact, every road of importance should be located with the idea of permanence in mind. Certainly, there is false economy in building a surface on a road that has unnecessarily sharp curves and steep grades. This has been done, however, in a number of instances.

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[*] Paper presented at the First Road Institute at the University of South Carolina, Columbia, S. C., Mar. 3-4, 1920.

[†] Associate Professor of Civil Engineering, University of North Carolina.

I have in mind a road in Surry County, North Carolina, between Dobson, the county seat, and Mount Airy, the principal town. Part of this road, that in Mount Airy Township, was surfaced with top soil about eight years ago, no changes being made in the location. The top soil material was excellent and for several years this was considered one of the best sand-clay roads in North Carolina. The surface of the road still holds up well, but the automobile traffic has reached such a degree of intensity that the sharp curves have become sources of great danger. The public generally, and especially the farmers, are clamoring for a new and safer location. The remainder of this road, that in Dobson Township, was surveyed and relocated and top-soiled about four years ago; but the location is a tremendous blunder, as is obvious to any one who examines carefully the situation. The distance from Dobson to Mount Airy by this route is 1 mi. too long and the grades on both sides of the wrong river-crossing are as steep as 8%. This is a glaring example of bad engineering; the responsibility, however, rests upon the township road organization and not upon the engineer. His methods of procedure were bound by local petitions and selfish interests of certain members of the township highway commission. This is a mistake that is apt to happen where a township attempts to locate a link of a county road system. The distance along the present road from Dobson to Mount Airy is 12 mi. The proposed new road which has been approved as a federal aid project will be only 11 mi. long. Five miles of the so-called improved road, together with a new bridge, will be abandoned, thus throwing away an investment of approximately $15,000.

We have yielded too much in the past to the temptation to follow an old established roadbed. Many of the reverse curves and steep grades that remain as permanent obstacles to modern traffic could have been avoided at the beginning. But after houses are built along the road, changes in location are often expensive and not feasible.

In using money from bond issues for roads, it is important to distinguish carefully between the permanent and the temporary features of the improvement. The alignment, drainage structures, foundations and grades may be considered permanent features if a competent engineer has done the work. It is not a bad investment then to use long term bonds on the permanent improvements, but short term bonds should apply always to the short-lived improvements. It is of course improper to use bond issue funds for the maintenance of roads.

More attention should be paid to the aesthetic features of road planning. The roads of Europe are ahead of ours in this respect. Years ago trees were planted on the roadsides that now have a priceless value. It has been suggested that the state highway departments should have a landscape gardener to plan the beautifying of the roads laid out by the state. During the past two years, the Wisconsin Highway Commission has paid great attention to the question of appearance in bridge construction. An ugly bridge is an offense to every passerby, and a little extra money for appearance's sake is well worth the cost, certainly for structures of concrete that are supposed to stand for all time.

One of the most pressing problems before road builders today is the danger and delay caused by weak bridges which were designed for less than half the loads that the roads now have to carry. Mr. H. E. Bread of New York stressed this point at a recent transport conference. He gives the following facts: "In New York State there are 33,775 bridges. Of a total of 251 bridges on the three main traveled routes from the Pennsylvania state line to New York City only 115 are built for 15 tons or over; 17.5% of them are built for less than a 5-ton load; 23 of them would stand less than 3 tons; on the less traveled routes the status of bridges is worse."

Since about March, 1917, reinforced concrete bridges, according to the Wisconsin Highway Commission report, have actually been cheaper even in first cost, foot for foot, than steel bridges of like capacity. This has led to the practical abandonment of steel bridges in Wisconsin and the large scale introduction of a superior construction material—reinforced concrete. The use of a more permanent type of bridge and culvert is more prevalent now in every state, and for this reason, it is important that they be built for the loads that are likely to come upon them in the future.

Drainage is often referred to as the most important single consideration in road construction and maintenance. One of the greatest difficulties in the actual construction and maintenance of roads is that of turning the water reaching the road off from it so as to provide efficiently for the proper drainage of the roadway. The best ways of doing this often require very careful investigation. An improperly drained road foundation will not hold in shape even the highest type of road surface.

After the road is located, there is one detail of the design which requires the most careful attention of the engineer, and that is the placing of the proper grade line on the profile. Here is where hundreds of dollars may be saved by adjusting the grade so that the volume of cutting and filling will be a minimum.

Road maintenance, of all problems in connection with better roads, is the one of which we have the most to do and the most to learn. People have been slow in realizing that the maintenance of roads should begin as soon as construction ceases; and that it requires the supervision of an experienced enginer just as much as does the maintenance of railroads. The old system of maintenance was a failure because it was based on the assumption that everybody knew how to keep a road in good condition. The chief reasons why the roads of France have a greater reputation for excellence than ours is due to the close attention they have paid to maintenance. With the continued rapid growth in motor trucking, the responsibility for the safety of the bridges will have to rest upon the state highway departments or some official. This means that general inspections of all the bridges at least every year by men of experience will be advisable. The railroads have found that such inspections are essential to the long life of structures and safety of travel. An inspection of a steel bridge, for example, might reveal the fact that it was deteriorating very rapidly, due to rust or other causes. Many concrete bridges are not permanent, due to errors in construction. Unless concrete is made of the best materials properly proportioned, it is apt to be porous enough to absorb water that would cause disintegration after freezing. In this connection, it should be mentioned that to secure the most efficient construction we must have the concrete work executed by competent and experienced builders working under experienced supervision.

Excessive cost of road maintenance may be due to three causes—inefficient methods of maintenance, poor construction or a wrong selection of the road surfacing material. It often happens that cheap first cost of construction leads to the most expensive road in the end. The selection of the most suitable road surface requires thorough technical knowledge,

(Concluded on page 152)

Relation of Highways to Motor Truck Operating Cost*

By ARTHUR H. BLANCHARD†

Highways are merely the means to an end: that end is economic and efficient transportation of passengers and commodities. If this fundamental principle had been the universal basis for the improvement of highways during the past twenty years, the problem of determining the relation of highways to motor truck operating cost would have been materially simplified. The highway transport engineer or manager cannot assume, for every transportation route, that what has been done is what should have been done. In fact, in the case of any one of thousands of proposed routes, he cannot assume that the highway is 100% improved, even based on the crudest ideas of what contitutes an improved highway. It is well to bear in mind that the construction of highways outside of municipalities is today in its infancy. Furthermore, it should be recognized that of the 2,500,000 mi. of highways outside of municipalities in the United States, only 12% can be classified as improved and that not over one-fourth of 1% are suitable to carry intensive motor truck traffic. No thorough consideration appears to have been given to the effect of highways on operating cost by many legislators and commissions when establishing schedules of legal rates for transportation of commodities. For example, the Nebraska uniform rate of 1.5 ct. per 100 lb. per mile recognizes the fact that the roads of Nebraska will not permit a 300 day a year business with 5-ton trucks, but entirely fails to recognize the fundamental fact that a 30-mile haul on one route may easily cost twice as much as on another route, particularly as only about 2% of Nebraska's rural routes are classified as improved.

It is evident that a thorough field investigation of every proposed highway transport route should be made and that the results of this survey should be an important factor in the final decision pertaining to the establishment of a highway transport business. The result of this survey, from the standpoint of highways, may be roughly classified under the following three heads: First, relation of unimproved highways to operating cost; second, relation of proposed new construction and the reconstruction of improved sections to operating cost; and third, relation of sections of improved highways, which will not be reconstructed for a period of less than five years, to operating cost.

The first class of sections of proposed route, namely, the unimproved portions of highways, may present conditions of narrow widths of roadways, steep grades, sharp turns or rocky, sandy or clayey surfaces, such that a glance will be sufficient to condemn the route for efficient highway transport. Generally speaking, unimproved highways constitute a positive economic barrier to the development of a highway transportation business. Take for example George H. Pride's 1919 average daily cost of $28.56 covering the operation of a 5-ton truck for an average of 50 mi. per day for 300 days per year. These figures are based on New York City conditions, including the average type of improved highways outside of cities over which his trucks operate. Let us diagnose Mr. Pride's cost sheet and determine what would be the effect of substituting a system of poor roads for the system of improved roads in the near vicinity of New York City. It is self-evident that poor roads would materially raise the cost of at least the following items on the cost sheet: Tires; oil, grease, etc.; gasoline; depreciation; maintenance; and lost time period. A combination of a rough roadway on steep grades for a 1-mi. section of a 25-mi. route might easily double or treble the operating cost, if not actually rendering continuous operation of a truck over such a route impracticable.

The following interesting deduction pertaining to saving in gasoline, which will result when the system of 5,000 mi. of highways in Illinois is improved, has been made by A. N. Johnson. He assumes that these highways will develop a traffic of 500 motor vehicles per day for 300 days in the year. He estimates that the saving of gasoline by the above traffic on improved roads as compared with earth roads would be 66,000,000 gal. per year or approximately $15,000,000. The results of tests carried out by the White Company, of Cleveland, with a 2-ton motor truck are of interest as an indication of the saving of gasoline due to operation of motor trucks on some of the types of pavements suitable for trunk highways, as compared with operation over earth roads. The investigations showed that on concrete and brick pavements it was practicable to operate a loaded 2-ton truck for an average of 115 mi. on one gallon of gasoline, whereas on the average earth road only 5.8 mi. to the gallon was obtainable. In round figures, the conclusion drawn from the test was that it was possible to operate the 2-ton truck on high class pavements for twice the distance which was practicable on earth roads.

The second classification of highway sections covers those parts of routes which are likely to be constructed or reconstruction within a comparatively short period after the establishment of a transportation business. This phase of highway improvements demands serious consideration, as construction and reconstruction generally imply that vehicular traffic will be shunted onto detours, most of which are far from satisfactory, considered from the standpoint of economic highway transport. The growth of motor transport will force highway engineers to give serious attention to providing serviceable roadways for traffic during highway improvement. In some cases roadways are provided alongside the highway under improvement; in others one-half of the highway is improved at a time, and in others the traffic uses detours. Highway transportation interests will soon emphatically demand that the same consideration be given to the facilitation of highway transport as is usually provided for railway transport when a railroad line is under reconstruction.

In connection with the third general class of highway sections of a given route, that is, improved sections which will not be reconstructed in the near future, it is necessary to consider the influence of each fundamental element of a highway transport. The elements which will be considered are: Drainage, foundations, grades, widths of roadway, shoulders, curves, roadway wearing courses and bridges.

Drainage and Foundations—American highway literature contains an enormous amount of advice pertaining to drainage and foundations. Although it is generally conceded that the importance of this subject has not been over-emphasized, nevertheless American practice is far from satisfactory. The writer believes that the increasing use of highways by motor transport will cause so many failures of insufficiently drained highways, and others which have weak foundations, that there will be a general improvement in the near future. As loads are transmitted from the wearing course to the foundation and from there distributed to the subgrade, the bearing power of the soil composing the subgrade is an important factor in the design of the highway. It is well known that the bearing power of soils in many instances is materially increased by efficient drainage. The roadway, therefore, should be so drained that the maximum bearing power of the subgrade is developed. While a poorly drained roadway might support a light rural traffic, it will be rapidly destroyed if subjected to commercial motor transport, including, for example, several 5-ton trucks.

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*Paper presented at the annual convention of the National Highway Traffic Association, Chicago, Ill., Jan. 29, 1920.

†Professor of Highway Engineering and Highway Transport, University of Michigan.

The greatest improvement noted in American foundation practice is the use of cement concrete foundations, or stone foundations of equivalent strength, on state trunk highway systems. The concrete foundation, as a structure, should be analyzed from the standpoint of the external forces acting upon it, the stresses resulting from such forces and the composition and depth of the concrete foundation to provide for the strains within it. Based on statistics furnished by many motor truck companies, the maximum concentrated load under one rear wheel may amount to 11,000 lb. This load, therefore, distributed over the area of contact of the tire may be considered the force for which the foundation should be designed, from the standpoint of direct compression. The foundation may likewise be considered as a beam or slab, two or four concentrated loads of the above amount being considered as beam reactions, while the upward pressure of the earth against the base of the foundation may be considered as a distributed load. Depending upon the possible position of the loads assumed, the beam or slab may be considered as a continuous structure or one with cantilever projections. Again, assuming that the subsoil under certain sections of the foundation is not in contact with the base of the foundation, a beam or slab action may take place, considering the external force to consist of a single concentrated load of 11,000 lb. and the beam or slab to have both ends fixed or to have one end fixed and one end free. It is self-evidnt that several assumptions may be made relative to pressure on the subsoil, the condition of the subsoil beneath the concrete foundation, the distribution of the external forces, and impact forces.

Although data are meager upon which to design concrete foundations, nevertheless it is high time that a concrete foundation should be looked upon as a structure and designed so far as possible according to the methods now used in designing other structures. The design of the foundation is particularly complicated due to lack of knowledge pertaining to the distribution of the load through the concrete, the pressure of the subgrade supporting the foundation, and the manner in which the concrete foundation acts as a structure. It is apparent, however, that a series of assumptions may be made upon which the design of the concrete foundation may be based, and that the results may be used as a guide to determine the composition and depth of the foundation.

The highway transport engineer or manager can neither assume that drainage systems and foundations have been scientifically designed nor that these important elements of a highway have been constructed in accordance with practice based on service tests. Highway transport literature contains many references to cases where motor trucks have become mired in poorly drained roadways or have broken through wearing courses supported by weak foundations. When the transport survey is made, care should be taken to determine, by inquiries along the route, the ability of the roadway to carry heavy loads during the spring especially. It is well to keep constantly in mind that an ideal roadway surface is not necessarily an indication that the drainage system and foundations are suitable for motor truck traffic. From the foregoing discussion it will be seen that poor drainage and weak foundations on a section of a transportation route may readily wreck a highway transport business or at least require the charging of higher rates to cover increased cost of operation.

Grades.—Only general deductions may be made pertaining to requirements relative to grades for motor transport. Unfortunately little data are at hand covering the relative efficiency of truck transportation over various grades on different types of roadway surfaces. Of course, the general deduction may be made that the cost of haulage varies directly with an increase in grade and that the tonnage which can be economically hauled varies inversely with an increase in grade. In all probability the present fundamentals of grade design will not be modified until sufficient data have been accumulated to demonstrate that present practices are uneconomical, either from the standpoint of motor transport or the maintenance of the roadway. The cost items relative to tires, grease, oil, gasoline, and lost time period, and probable depreciation and maintenance, will be increased by material grades on transport routes. General allowance can be made, but close estimates are impracticable unless the transport engineer has had experience with exactly the same conditions which he encounters on a new route.

Widths of Roadway and Shoulders.—Roadways economically designed must provide for carrying the traffic on the paved roadway surface and not rely upon earth shoulders to carry a part of the traffic or serve as turnouts. It has been demonstrated that the latter practice is not economical from the standpoint of the maintenance of the pavement or shoulders, nor is it efficient or safe from the standpoint of traffic using the highway. In order that a two traffic line highway should be satisfactory for all classes of vehicular traffic, it will be necessary to follow English interurban traffic practice which requires that slow moving, or in this case, commercial traffic, shall keep to the side of the roadway. It is, however obvious that a heavy motor truck operator will insist upon allowing a certain amount of leeway between the outside wheels of the truck and the edge of the roadway, as many operators have had unfortunate experiences with motor trucks being stalled in soft shoulders, or ditched. From observations of commercial traffic made on many highways outside of municipalities, it is the writer's conclusion that it will be necessary to allow at least a foot clearance between the body of the truck and the edge of the paved roadway. Furthermore, these observations indicate that motor truck drivers, traveling at speeds from 10 to 15 mi. an hour, will endeavor to maintain a clearance of 2 ft. between passing vehicles. A consideration of the maximum width of 8 ft. of each of two trucks and the clearances suggested indicates that a minimum of 20 ft. for two lines of traffic is a conservative recommendation. It should be observed that the county highways of England and the national routes of France have been constructed with roadways having widths of not less than 20 ft., for many years. If the transportation survey indicates that the amount of traffic will require provision for more than two lines of vehicles, a greater width than 20 ft. should be adopted, the additional width depending upon the character of the traffic. It does not require much imagination to reach the conclusion that many interurban highways will be subjected, during the next decade, to traffic which will necessitate roadways sufficiently wide to accommodate at least two lines of motor trucks and two lines of passenger cars.

The above discussion indicates that highway transport investigators will do well to give careful thought to widths of roadways on a proposed route. On a narrow roadway, say

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Copy for classified and other advertisements where proofs are not required will be accepted until noon on Monday of the week of issue.

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LOST EXPERIENCE

There have been few, if any, equal periods of time in which so many changes have been made in the personnel of state highway departments as during the past year. In some cases these changes have been from one state to another, but in many of them the shift has been from the public service to private practice or to the staffs of private organizations.

What are the causes of this, and what are its effects upon the efficiency of the highway organizations that lose experienced men?

Among the causes, politics undoubtedly ranks high, but probably not so high as the low salaries paid to engineers in the highway field. Many an engineering employee in a state highway department gets less money than a mason on one of the jobs he designs or supervises—and he works harder for what he gets. Not a few of them receive less remuneration than a common laborer on a road job and most of them get less than the various skilled workmen to be found on any piece of construction work of any size. And they get no "time and a half" or "double time" for extra work. They are permitted—sometimes obliged—to put in many hours of "overtime," for which they seldom get more than perfunctory thanks. Having spent from three to four years and a few thousand dollars in acquiring a special training for their work, can they be expected to be satisfied? And, being intelligent and observing human beings, as well as capable technicians, can they be expected not to take advantage, when possible, of their knowledge that private business organization pay better salaries?

When an engineer who has served several years in a highway department leaves to take a better paying position somewhere else, the taxpayers are very real losers. If the man is good enough to get a better job, he is good enough to keep. He is an able man and he has acquired experience that is valuable to the public he serves. But if the public, through those who make the laws, does not appreciate the worth of that experience enough to permit the employee to realize on it through an increase in salary, it must expect to lose the man. And that means that it must also lose the benefit of the experience he has gained, for that experience is his; it can not be taken from him.

Labor turn-over is admittedly one of the greatest economic wastes of the present industrial system. Though the term is generally used with reference to grades of workers considered lower than an engineering employee, its use can well be extended to cover the workers who bring to their tasks special education and training, for the higher the qualifications for a given position, the greater is the loss to the employer when a change is made in it.

The loss to the public through unnecessary changes in the highway departments of the states and counties is enormous and it is a waste that is needless and that could be eliminated by a comparatively small expenditure. Living salaries and security in positions are certain remedies.

HAULING BY TRAILER

Manufacturers of trailers are making strong efforts to secure the passage of laws permitting the use of trailers and to secure the repeal or modification of laws that prohibit or seriously restrict their use. They base their contention that such action should be taken chiefly upon three arguments—that the use of trailers lowers hauling costs; that trailers and trailer trains are not sources of danger to other traffic; and that a truck and trailer or trailers damage a road surface less than does a truck alone carrying a load of equal weight.

It is doubtless true that the development of trailer hauling has been retarded by restrictive legislation. And while most of the laws of this nature have been enacted as the result of an honest intent to conserve the highways, many of them have doubtless been drawn under a misunderstanding of the actual effects of trailers upon the roads — as is suggested in a statement by the Trailer Manufacturers' Association, which is reviewed on another page.

The use of locomotives and cars instead of a single vehicle carrying the power plant and the load is somewhat like the use of the truck and trailers. The conditions in railroading and in highway transport are not exactly analogous, but they are sufficiently so to admit of the use of the argument that if separate load carriers are economical in the one case they should be in the other also.

That under certain conditions the trailer and truck form a more efficient and economical hauling unit than does the truck alone seems to be generally conceded. That being so, it necessarily follows that provision should be made for the use of such unit. But it does not follow that its use should be allowed if, or where, the resulting damage to the road will more than offset the saving in hauling cost.

This involves the old question of whether to fit the road to the load or to trim the load to the road. As expressed in the statement to which refernce has been made: "It is largely a matter of economics, the question being whether it is cheaper in the long run to provide suitable roads for motor vehicle traffic or to prevent further reduction in the cost of haulage by unduly restricting such traffic."

The answer lies somewhere between the prohibition of all use of the trailer and the throwing open of all roads to trailers of unlimited weight and of any type. The trailer is useful vehicle and there is going to be more and more demand for it utilization. Just and equitable laws must be enacted if highway transportation is to be developed to its maximum usefulness. Highway engineers should be the ones to work out the details of these laws and they can be the ones if they will make make the effort.

This is one of the many opportunities for the engineer to rise above the plane of the mere technician and take his rightful place among men of affairs.

Pennsylvania Townships to Receive State Money

State Highway Department Announces the Allotment of $1,000,000 Appropriated by 1919 Legislature as State Rewards to the Township Supervisors—Sums by Counties

The Pennsylvania State Highway Department has announced the allotments to various counties of the $1,000,000 appropriated by the 1919 Legislature for the payment of state rewards to township supervisors.

This apportionment takes the place of the awarding of bonuses to townships which obtained until the passage of the new law. The money has been apportioned among the various counties according to the miles of road in townships of the second class, the mileage being computed from surveys made by the Township Division of the Department. The townships of the second class in the state have a total road mileage of 74,875 mi., making the distribution at the rate of $13.35 per mile. The amounts apportioned to various counties of the state, with the mileages of roads in the counties, are as follows:

Adams, 981 mi., $13,101.83; Allegheny, 1,022 mi., $13,649.41; Armstrong, 1,692 mi., $22,597.66; Beaver, 902 mi. $12,046.74; Bedford 1,618 mi., $21,609.34; Berks, 2,131 mi., $28,460.76; Blair, 565 mi., $8,080.13; Bradford, 2,368 mi., $31,626.04; Bucks, 1,625 mi., $21,702.83; Butler, 1,728 mi., $23,078.46; Cambria, 927 mi., $12,380.63; Cameron, 125 mi., $1,669.68; Carbon, 454 mi., $6,063.44; Center, 974; $13,008.34; Chester, 2,045 mi., $27,312.18; Clarion, 1,168 mi., $15,599.33; Clearfield, 1,639 mi., $21,889.81; Clinton, 454 mi., $6,063.44; Columbia, 1,088 mi., $14,530.88; Crawford, 1,941 mi., $25,923.20; Cumberland, 1,035 mi., $13,823.04; Dauphin, 845 mi., $11,285.47; Delaware, 273 mi., $3,646.08; Elk, 428 mi., $5,716.19; Erie, 1,416 mi., $18,911.52; Fayette, 1,563 mi., $20,874.78; Forest, 288 mi., $3,846.41; Franklin, 1,108 mi., $14,797.99; Fulton, 580 mi., $7,746.24; Greene, 1,404 mi., $18,751.25; Huntingdon, 1,039 mi., $13,876.46; Indiana, 1,848 mi., $24,681.13; Jefferson, 1,169 mi., $15,612.68; Juniata, 655 mi., $8,747.91; Lackawanna, 554 mi.,, $7,399.00; Lancaster, 2,567 mi., $34,283.80; Lawrence, 797 mi., $10,644.41; Lebanon, 704 mi., $9,402.34; Lehigh, 1,070 mi., $14,290.48; Luzerne, 1,143 mi., $15,265.44; Lycoming, 1,323 mi., $17,669.45; McKean, 549 mi., $7,332.22; Mercer, 1,566 mi., $20,914.85; Mifflin, 343 mi., $4,580.97; Monroe, 789 mi., $10,537.56; Montgomery, 1,414 mi., $18,884.80; Montour, 308 mi., $4,113.52; Northampton, 941 mi., $12,567.61; Northumberland, 1,012 mi., $13,515.86; Perry, 863 mi., $11,525.87; Pike, 467 mi., $6,237.06; Potter, 922 mi., $12,313.85; Schuylkill, 1,254 mi., $16,747.91; Snyder, 644 mi., $8,601.00; Somerset, 1,832 mi., $24,467.44; Sullivan, 430 mi., $5,742.90; Susquehanna, 1,577 mi., $21,061.77; Tioga, 1,558 mi., $20,808.01; Union, 426 mi., $5,689.48; Venango, 989 mi., $13,208.68; Warren, 926 mi., $12,367.28; Washington, 2,079 mi., $27,766.27; Wayne, 1,210 mi., $16,160.26; Westmoreland, 2,455 mi., $32,787.97; Wyoming, 543 mi., $7,252.09; York, 2,482 mi., $33,148.57.

Highway Legislation in New York

Brief Reviews of the More Important Measures Introduced at the Present Legislative Session

The usual flood of bills amending the highway and motor vehicle law of New York state has been introduced at the present session of the Legislature. These measures include the usual appropriation bills, proposed laws relative to the administration of highway work, and bills for the regulation and operation of motor vehicles. Brief synopses of the more important measures are contained in the following paragraphs.

Among the more important appropriation measures are the following:

No. 773, introduced in the Senate on March 1 by Mr. Pitcher, provides for the appropriation of $261,359.79 for the construction of state and county highways, in accordance with the provisions of section 140 of the highway law of 1915.

No. 907, introduced in the Assembly on February 27, by Mr. Machold, provides for the appropriation of $300,000 for the payment, in the first instance, of the Federal Government's share of the cost of constructing roads under the Federal Aid Road Act of 1916.

No. 919, introduced in the Senate on March 4 by Mr Hewitt, appropriates $3,750,000 for the payment of the state's share of the cost of constructing roads under the Federal Aid Road Act of 1916. This law provides that the cost of constructing state routes by federal aid shall be borne 50% by the Federal Government and 50% by the state, and that the cost of constructing other roads by federal aid shall be borne 35% by the Federal Government, 35% by the state and 35% by the county.

No. 112, introduced in the Senate on January 20, by Mr. Knight provides for the amendment of the existing highway law to provide that the state shall bear the expense of constructing and repairing bridges on state highways.

No. 112, introduced in the Assembly on January 14 by Mr. Cross, appropriates $125,000 for the joint acquisition, with the state of Pennsylvania, of the franchises and property of corporation and individuals owning or operating bridges across the Delaware River.

No. 1072, introduced in the Assembly on March 4 by Mr. Leininger, provides for the construction of a tunnel for vehicular and pedestrian traffic between Astoria, Long Island, and the Borough of Manhattan.

Several of the bills relate to the distribution of the cost of highway work, the more important of these being as follows:

No. 111, introduced in the Senate on January 20 by Mr. Knight, provides that the secretary of state shall pay to the treasurer of each county 50% of the registration fees for motor vehicles collected from residents of that county, instead of 25%, as under the present law.

No. 155, introduced in the Senate on January 22 by Mr. Lowman, provides that the state shall pay annually to the several counties for the construction or improvement of other than county highways an amount equal to the amount levied in the counties for highway purposes under the general law of the state. No county, however, shall receive more than $30 per mile for its total mileage of highways outside of cities and incorporated villages.

No. 429, introducd in the Senate on February 11 by Mr. Hewitt, provides that cost of constructing federal aid high-

(Concluded on page 156)

HIGHWAY TRANSPORTATION

Trailers for Road Hauling

Use of Trailers and Semi-Trailers Should be Encouraged Instead of Discouraged, is Claim of Manufacturers—They Reduce the Cost of Hauling, Do Not Cause Undue Wear of Road Surfaces and are Not Dangerous

Legislation regulating traffic should be of the character to encourage rather than discourage the use of trailers, and should fix the registration fees for trailers at a lower figure than those for motor trucks of equal carrying capacity, according to the manufacturers of trailers as set forth in a recent statement from the Trailer Manufacturers Association of America. These claims are based on three principal arguments which are, briefly, as follows:

"Highway" Trailer Operated by a Wsconsin Milk Distributor

Warner Trailer Used by an Eastern Hide and Tallow Concern

Troy Trailer Carrying Load of Crated Automobile Parts

"Trailer Truck" Employed in Hauling Long, Heavy Timbers

VARIED USES OF TRAILERS AND SEMI-TRAILERS IN HIGHWWAY TRANSPORTATION

First, trailers reduce hauling cost; second, trailer trains are not dangerous; and third, trailers and trailer trains cause less wear on the roads than do other vehicles carrying equal loads.

In regard to the first argument, it is stated that it is now generally recognized that under good road conditions the cost of haulage can be reduced from 20 to 40% by employing a trailer or trailers with a motor truck, the capacity of the truck being doubled and sometimes tripled by this means. In support of this it is stated that some municipalities in New York and other states find fleets of trailers the most economical means for the collection and disposal of ashes and garbage. It is further stated that this same method would undoubtedly be used in other cities, if the state laws did not forbid the hauling of trailer trains. Reference is also made to the possibility of hauling loads of different materials and of hauling loads to different delivery points.

Such possibility of danger to other traffic as may have existed in the use of trains of trailers has been largely eliminated, it is stated, by the improvements that have been made in the design of trailers. The provision in the New Jersey law prohibiting the towing of more than one trailer or semi-trailer was probably included, the association believes, because of the mistaken idea that a string of two or more trailers would obstruct the highway at turns and endanger other traffic. It is pointed out, however, that modern trailers are so designed that the wheels follow in the tracks of the towing vehicle and will pass around curves without crowding toward the inside and endangering other vehicles. It is also argued that instead of increasing traffic congestion, the use of trailers will lessen it by cutting down the number of transportation units required.

In discussing the effect upon the road surface, it is pointed out that the total weight of the load carried by a truck and a trailer, or a train of trailers, is distributed over a greater number of wheels, thus reducing the pressure of any one wheel upon the road surface. It is also pointed out that the combined weight of a truck and a trailer is considerably less than the weight of a truck of corresponding capacity, since, while a 7-ton truck weighs about 14,000 lb., a 3½-ton truck and a 3½-ton trailer have a total weight of only about 11,000 lb. It is further argued that the weight carried by the trailer is carried on free-rolling wheels, thus eliminating the shearing action exerted by the drive wheels of a truck.

"The whole subject of suiting the highways and the traffic that uses them to each other," according to the statement, "is a particularly difficult one, and there are bound to be differences of opinion as to how this should be done. It can be done only by acquiring a full knowledge of all conditions and factors, so it is necessary that the highway departments and legislatcrs and the motor vehicle interests should get together and learn each other's problems. They can then arrive at a fair and proper solution which will result in providing the most economical system of highway transportation for persons and property. It is largely a matter of economics, the question being whether it is cheaper in the long run to provide suitable roads for motor vehicle traffic or to prevent further reduction in the cost of haulage by unduly restricting such traffic. A fair balance can be struck somewhere between the cost of highway construction and maintenance and the cost of operating motor vehicles. If too little money is spent on the roads, the consumption of gasoline, the wear and tear on vehicles and tires and the loss of time by machines and drivers become excessive. On the other hand, if relatively few excessively heavy vehicles operated at high speed quickly ruin costly roads, the temporary saving in operating costs is more than offset by the expense of repairing the highways.

"The trailer, more than any other road vehicle, requires good, level roads for successful and economical service. For this reason the trailer interests favor reasonable restrictions on the size, weight and speed of trucks and trailers and do not object to fair registration fees for trailers, provided the fees go into a fund for highway work. As a matter of equity, however, they believe that all vehicles using the highways should pay similar fees corresponding to the use made of the roads and the relative wear and tear on them."

Trucks Lower Haulage Costs in Michigan

Road Commission of Cass County Reports Haulage Cost of 22 cents per Yard Mile by Truck Against 62 cents with Horse

The annual report of the Cass County Road Commission, Cassopolis, Mich., discloses some interesting figures on the comparative costs of motor and horse-drawn vehicles in road building work. The report shows that truck hauling on the Wayne Road is done at a total expense of 22 ct. per yard-mile, as compared with horse hauling at 62 ct. per yard-mile.

"The Commission selected and purchased one 2-ton truck," the report runs, "which was delivered and placed in service early in the spring. The results were so satisfactory that two more were purchased and later three similar trucks were received from the State Highway Department.

"As the haul in the road is very long it is a good place to test the advantages of truck hauling. No team hauling was done. The work cards as returned by the drivers show that the trucks hauled 1,368 yd. of gravel to the Wayne Road. The total mileage was 9,436 mi. Gasoline used was 2,694 gal. at a cost of $673.50. The oil used was 600 quarts which cost $60. The total cost for drivers' wages was $832.75. The average haul was about 7 mi.

"Taking the above figures as a basis, the cost per yard would be 16.6 ct. for operating expenses while repairs and replacements have cost 5.4 ct. per yard-mile or a total operating and repair expense of 22 ct. per yard-mile.

"Comparing truck hauling on this same job with team hauling, it would cost as follows: The average distance being 7 mi., round trip would be 14 mi. As two trips would be out of the question this would represent a day's work which could not be obtained for less than $6.50. On a yard-mile basis the cost would have to be 62 ct. to enable a team to earn $6.50 per day hauling the above distance. Our experience has been that on hauls of less than 1 mi. the difference in cost between truck and team hauling is not very great. But cheap hauling is not the only advantage of mechanical hauling. Trucks thrive in hot weather and there is no falling off in work on that account. They will work as many hours per day as is necessary."

Relation of Highway Engineer to Successful Road Location, Construction and Maintenance

(Concluded fom page 146)

a familiarity with local prices and materials, a clear understanding of the present and probable future travel conditions and a knowledge of the local social and political conditions. In no case can a wise choice be made without due consideration of all the factors involved.

In conclusion, allow me to emphasize again the importance of using the utmost care in proceeding with this road building business. Scientific methods should prevail everywhere. The pulse of the public should beat more patiently and less critically. It behooves the engineer and the contractor to work harmoniously together both towards the same end of securing the most economical and lasting results.

Relation of Highways to Motor Truck Operating Cost

(Continued from page 148)

from 9 to 14 ft., there will be, in many cases, continual danger of running on to earth shoulders with resultant serious loss of time if the truck should become stuck in soft material. Furthermore, a given width of roadway is able to carry a certain maximum traffic. As this limiting amount of traffic is approached or exceeded, there will be serious loss of time due to congestion of vehicles. The cost item of lost time, therefore, may be materially increased due to narrow and inadequate roadways existing on a given transport route.

Curves.—Motor vehicle traffic has effected a decided improvement in the design of highway curves, especially in the direction of the easing of sharp curves, provisions for clear sight around curves and the banking of roadways The importance of these details will be accentuated by the development of motor truck traffic. Many routes have so many sharp turns, that this element of highways may effect economic transport through lost time in negotiating such turns, increased wear of tires, and possible depreciation and maintenance due to collisions or other accidents.

Roadway Wearing Courses.—The forces due to motor truck traffic, which should be given consideration in the selection of a roadway wearing course, are the direct load causing compression in the wearing surface, impact forces, and shearing forces of the driving wheels, the amount of which will be a function of the weight of the vehicle and the speed at which it travels. If all of these forces have not been given proper consideration, the wearing course will wear rapidly or will disintegrate. The wearing course is of particular interest to motor truck users because of the variations in resistance to traction on different types of roadway surfaces. Statistics are meager relative to traction, especially as concerns motor trucks. Investigations made to date are merely a drop in the bucket as compared with the amount of research which should be undertaken in order to have available reliable data. At the present time, only the most general conclusions can be drawn, as was the case with the tests carried on by the White Company, cited previously.

Highway transport interests should give careful consideration to the effect on motor trucks due to travel on different types of roadway wearing courses. The mistake is too often made of considering wearing courses in their ideal state or during the first six months after completion. All types wear under traffic and hence the character of the surface of a roadway after two to five years of life is generally more important than its condition upon completion of an improvement. Not only is resistance to traffic increased as the surface becomes worn, but, furthermore, the effect on the motor truck through impact forces caused by travel on rigid monolithic pavements will result in a material advance in depreciation and maintenance charges.

Bridges.—A bridge is an integral part of a highway. It is to be regretted that this fact usually has not been recognized by law makers. Many highways are built of sufficient strength to carry the motor traffic to which they are subjected, while the bridges are so weak that their condition prevents the use of the highway by a part of the motor truck traffic. Many citations may be given of highways which have had to be abandoned as commercial transportation routes, due solely to the weak condition of the bridges. One reason for this condition is that many state laws provide for the construction and maintenance of roadways by the state, while the bridges are under the jurisdiction of counties or towns. It is self-evident that bridges of trunk highways connecting municipalities should be designed for loads of not less than 30,000 lb., and it would appear advisable, considering the character of the structure, to follow the practice of the Pennsylvania State Highway Department and design highway bridges for loads of 40,000 lb. The clear width of the roadway of a bridge should comply with the requirements pertaining to roadway width cited above. In addition, the vertical clearance should be given consideration, and in this connection the over-all height of 12 ft. 2 in. for motor trucks, heretofore mentioned, should receive attention. This is an important factor, not only in the design of through truss bridges but likewise in providing for clearance underneath railway bridges.

Highway transport companies should thoroughly investigate permissible loads, clearances, roadway widths of highway bridges on transportation routes. Many instances have come to the attention of the writer where bridge load limits of two or three tons have occurred on highways whose surfaces were capable of carrying 5-ton motor truck traffic.

English Practice.—A discussion of the relation of highways to operating cost would be incomplete without reference to the large fund of general information which may be found in the motor truck literature of England where highway transport outside of municipalities has been under development for several decades. The status of motor transport in England in 1909 is aptly described in the following statement by Col. R. E. Crompton, M. Inst. C. E.

"Although our roads came first, and their development occupied the best thoughts of our leading engineers at the time of Telford; when railways were introduced road development took a second place until quite recently, when it was seen that the general introduction of motor vehicles was rapidly bringing back the roads into favor, not only for carrying passengers and distributing materials for short runs, but to act as feeders to the railways, and in many cases to become rivals to the railways themselves for short hauls, or, in fact, in all cases where economics in the terminal charges and in the packing of goods, especially those of a perishable character, can be effected by these goods being loaded at the starting point into a vehicle which carries direct to the consumer without transhipment or intermediate handling. The economical advantages of this last consideration are so great that many business firms have now found that they prefer to deliver direct in their own vehicles goods which they had hitherto to send by their horse-drawn vehicles to the railway stations and which had to be twice transferred, first, from their vehicles on to those of the railway and again from the railway vehicles to the railways vans. A study of the statistics of increase of traffic on roads radiating distances of at least 30 mi. from our large business centers has shown us that, as the vehicles and as the roads themselves are improved, this radius of direct haulage is likely to increase, and will probably have a very important effect on the distribution of the population and must with absolute certainty be reckoned with in considering all questions of construction and upkeep of the roads themselves."

Conclusion.—The foregoing discussion indicates that the probable cost of transport over highways outside of municipalities is not susceptible of an exact mathematical analysis. Although this situation is far from satisfactory, it does not mean that highway transport should not be based on as definite analysis as our present fund of information and experience warrants. The interrelationship between highways and the cost of highway transport is so interwoven and complex that many highway transport managers have literally thrown up their hands and simply taken a chance upon the results to be secured from organizing transportation companies. Based on the meager investigations made to date, taken in combination with the combined experience of English and American highway transport authorities and highway engineers, it is evident that certain general conclusions may be drawn as a result of a careful highway transport survey for any proposed transportation business. A consideration of these deductions will usually warrant the installation of a highway transport business or the positive rejection of the proposition. This is particularly true when it is considered that the installation of highway transport in a given community should not be based on a narrow margin of profit. There are too many uncertain factors, such as competition with other transport companies and common carriers by rail and water, state regulations pertaining to weights, dimensions and speeds of motor trucks, legislation pertaining to licenses, franchises and rates, snow removal practice, and variations in the volume of business, to justify a highway transport engineer or manager figuring profits and losses from a business standpoint in thousands of dollars and the variations in operating cost due to the several highway factors in thousandths of a cent.

———OOO———

Convict Labor is Being Used in Washington County, Arkansas. A gang of about a hundred prisoners is at work on the Winslow Road

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Highway Departments of 29 States are to receive 1,500 army field ranges received by the Department of Agriculture from the War Department.

Oklahoma Counties will share in the apportionment of $3,115,000 of unclaimed federal aid money during 1920, according to a recent statement by State Highway Engineer Robert C. Terrell. Of the total amount, $2,200,000 will not be available until July 1. In order to obtain federal money, the counties must appropriate funds to equal the amount sought from the Government.

EQUIPMENT—TRADE—MATERIALS

Booklet on Texaco Road Oil

"Texaco Road Oil," is the title of a 24-page booklet, 3½x6 in. in size, recently issued by the Asphalt Sales Department of the Texas Company, of New York, N. Y.

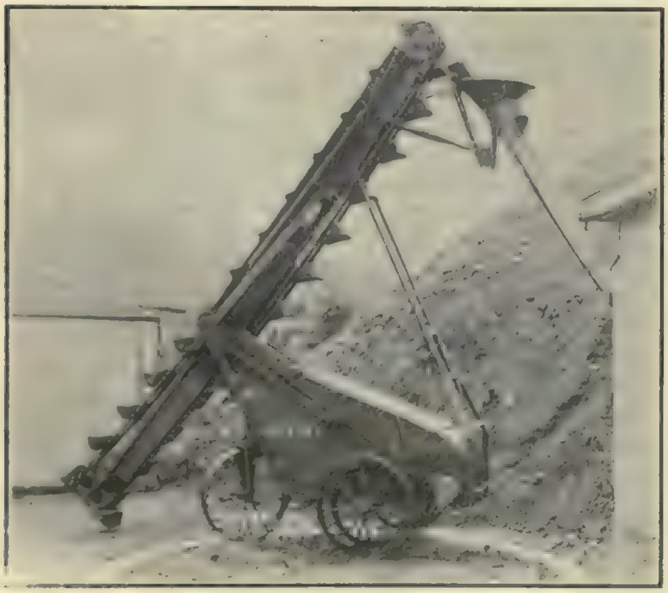
The booklet includes a chapter on the history of road oil; paragraphs giving directions for preparing road surfaces for oil treatments; descriptions of the various Texaco materials, and a number of tables. These latter include a table of the amount of oil required for 1 mi. of road; a table of the amount of sand and stone required for 1 mi. of road; a table of comparative temperatures; a table of specific gravity and pounds per gallon; a table of temperatures of saturated steam at various gauge pressures and a table of the amount of asphalt required per mile in the penetration method.

The booklet is printed in red and black, and is profusely illustrated with views of roads treated with Texaco products.

New Radial Loader

The constantly increasing cost and the scarcity of labor are rapidly increasing the use of labor saving machinery, especially in operations like loading and unloading which, under the former conditions of plentiful and cheap labor, were commonly carried out by large gangs of men. Machinery manufacturers are alive to the situation and are constantly bringing out entirely new equipment or improvements upon equipment that has been on the market for some time.

An example of the latter is shown in the accompanying illustration of a new type of loader recently brought out to meet the ever changing conditions in the industrial field.



JEFFREY RADIAL LOADER

The loader consists essentially of an adjustable bucket elevator and delivery chute, mounted upon a 3-wheeled truck and equipped with either an electric motor or a gasoline engine to operate the elevator and propel the machine.

The 3-wheel construction enables the machine to move in a straight line into and out of a pile of material or to make a wide path through a pile by swinging from side to side upon its driving wheels as a pivot. This is accomplished by means of a differential, permitting the driving wheels to act separately or together.

The machine will handle crushed stone, sand, gravel, coal and similar materials, taking crushed stone up to the 2½ in. size and coal in lumps up to 6 in. The buckets are 14x10 in. and are made of heavy malleable iron, with digger edged steel teeth riveted on the front lips and the ends. It has a capacity of 1 cu. yd. per minute; a fast speed of 60 ft. per minute, for traveling from pile to pile, and a slow speed of 4 ft. per minute for working into the pile.

The machine is known as the Jeffrey radial loader and is manufactured by the Jeffrey Manufacturing Co., of Columbus, Ohio.

PUBLICATIONS

CANADIAN GOOD ROADS ASSOCIATION. Proceedings of the Sixth Annual Congress. Paper 6x9 in., 100 pages and covers. Published by the Roads Department of the Province of Quebec, Canada, for the Association.

Included in this volume of the "Proceedings" are a list of the officers of the association and a report of the proceedings of the sixth annual congress held by the association May 20, 21, 22 and 23, 1919, at the Parliament Buildings, Quebec. Among the papers presented were, "Highway Maintenance," by Capt. J. A. Duchastel, City Manager of Outremont, Canada; "Drainage and Foundation," by Gabriel Henry, Chief Engineer of the Province of Quebec Highways Department, and "Bituminous Macadam," by A. W. Dean, Chief Engineer, Massachusetts Highway Commission.

A PICTURE OF PROGRESS ON THE LINCOLN HIGHWAY. Report of the work of the Lincoln Highway Association. Paper, 9x12 in., 40 pages and covers, illustrated. Published by the Lincoln Highway Association, Detroit, Mich.

This report contains a history of the association and an account of the work which has been accomplished. Since the armistice road construction on this highway has been resumed with greater vigor than before and in 1919 over $9,000,000 was expended on this system and 377 mi. of roadway constructed. According to this report the highway in the Eastern states, New Jersey, Pennsylvania, and Ohio, West, Indiana, Illinois, Iowa and Nebraska, there have been "spectacular changes in public sentiment and the most important developments in the way of new legislation, the providing of enormous road funds and in actual constructive results," and it is expected that the gaps of the system in this division will be closed in a short period. The Western Division of the system, in the states of Wyoming, Utah, Nevada and California, presents the problem of large area with small population and improvement lags because of lack of funds to carry on an extensive program.

MEETINGS

Calendar of Coming Meetings

Apr. 12-17—United States Good Roads Association—Eighth Annual Convention, Hot Springs, Ark. Director General, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

Apr. 16-17—Bankhead National Highway Association—Fourth Annual Convention, Hot Springs, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

Engineers and Assistants of the Pennsylvania State Highway Department

The annual meeting of the engineers and assistants of the Pennsylvania State Highway Department was held in the House Caucus Room of the State Capitol at Harrisburg, March 1-13, inclusive. The meeting was opened on Monday forenoon, Mar. 1, by Chief Engineer W. D. Uhler, of the Department. After his introductory remarks, State Highway Commissioner L. S. Sadler was presented, and then an address was made by Assistant State Highway Commissioner Geo. H. Biles. The remainder of the session was devoted to the presentation of papers on "The Organization of the Pennsylvania State Highway Department," by G. G. Hatter, Executive Manager, and "Cooperation between the Department and the Public at Large," by M. H. James, Director of the Extension Bureau of the U. S. Bureau of Public Roads. The topics covered at the remaining sessions and the papers scheduled were as follows:

Monday afternoon, March 1: Drainage: "The Advantages of Deep Ditch and Sub-base Stone Drainage Schemes," "Where and How to Place Tile Drains," and "The Effects of Poor Drainage in Differing Soils on Road Surfaces," by P. M. Tebbs, Construction Engineer.

Tuesday forenoon, March 2: Field Surveys for Materials: "Some Guides in Prospecting for Suitable Road Building Stone," by J. L. Herber; "Geology as an Aid in Decreasing the Costs of Highway Construction," and "The History of Road Building Sands in Pennsylvania and the Manufacture of Artificial Sands," by H. S. Mattimore, Engineer of Tests.

Tuesday afternoon, March 2: Testing Concrete Materials (Sand): "How Tests are Made on Portland Cement," by Charles T. Raber; "The Sieve Test for Sand with its Interpretation," "The Colorimetric Test for Sand and How it Should be Used," and "The Strength of Mortars," by H. S. Mattimore, Engineer of Tests.

Wednesday forenoon and afternoon, March 3: Coarse Aggregates: "The Comparative Values of Pennsylvania's Road Building Stones," "The Testing of Coarse Aggregates for concrete Mixes," and "The Determination of the Comparative Values of Natural and Artificial Sands and Grits in Concrete Construction," by H. S. Mattimore, Engineer of Tests; "The Routine Testing of Coarse Aggregates," by M. H. Ulman, Chemist.

Thursday forenoon and afternoon. March 4: Testing Bituminous Road Materials: "Present Practice in the Use of Asphalt in Road Construction," by D. A. Grant; "The Origin and Testing of Tar Products for Road Construction," M. H. Ulman, Chemist; "The Routine Tests of Asphalt and Why They are Made," "The Construction of Penetration and Mixed Asphalt Macadam Roads," "The Preparation and Use of Sheet Asphalt Surfacing," and "The Classification and Construction of Asphaltic Concrete Surfaces," by Julius Adler.

Friday forenoon and afternoon, March 5: Testing Bituminous Materials: "The Methods Used in Testing Asphalts and How the Tests Should be Interpreted," and "The Methods Used in Testing Tars and How the Test Should be Interpreted," by M. H. Ulman, Chemist; "The Analysis of Bituminous Sands and Fillers and their Use in the Field," by D. A. Grant; "The Merits of Coarse and Fine Aggregates Found in Pennsylvania which can be Used in Different Types of Bituminous Pavements," by Julius Adler.

Saturday forenoon, March 6: Vitrified Brick: "The Preparation of Foundations for Vitrified Brick Pavement," by P. M. Tebbs, Construction Engineer; "Classifying, Testing and Inspecting Vitrified Brick," by M. H. Ulman, Chemist.

Monday forenoon, March 8: Township Highways, the Design of Roads and Streets: "Township Highways," by Joseph W. Hunter, Township Commissioner; "Fundamental Principles Used in Designing Road Surfaces for Primary and Secondary Highways," H. E. Hilts, Office Engineer.

Monday afternoon, March 8: Bridges and Structures; "The Determination of the Proper Size of Structure for Given Drainage Areas," and "Small Culverts, their Design and Construction," by Willis Whited, Bridge Engineer; "How to Stake Out Bridges and Culverts," by T. C. Frame, Assistant Construction Engineer.

Tuesday forenoon, March 9: "Making Span Diagram for the Use of the Bridge Division in Designing New Structures," and "The Relative Cost of Different Types of Culverts and Bridges," by H. E. Hilts, Office Engineer; "The Location and Design for Grade Crossing Improvements," by O. E. Jackson, Assistant Construction Engineer.

Tuesday afternoon, March 9: "Coordinating the Activities of a District Office Organization," by C. E. Myers; "The Activities of a District Engineer with County Officials," by J. S. Ritchey; "Federal Aid Road Work," by Thomas H. MacDonald, Chief, U. S. Bureau of Public Roads.

Wednesday afternoon, March 10: "The Proper Method of Conduct of Surveys for Roads and Pavements," by T. C. Frame, Assistant Construction Engineer; "Our Methods of Locating Bridges and Making Span Diagrams," by C. W. Erisman, District Engineer.

Wednesday afternoon, March 10: "The Proper Method of Preparing Plans for Roadways in District Offices," by W. R. Wolfinger, District Enginer; "The Construction of Concrete Roads," by H. E. Hilts, Office Engineer.

Thursday forenoon, March 11: "Maintaining State Highways," by W. A. Van Duzer, Assistant Maintenance Engineer; "The Important Features to be Covered in Preliminary Inspections," by A. M. White, Assistant Construction Engineer.

Thursday afternoon, March 11: "Why We Should Intensify our Efforts on Material Surveys," by H. S. Mattimore, Engineer of Tests; general discussion and open forum on the day's proceedings; "The Construction of all Types of Bituminous Roads and Pavements," by Julius Adler.

Friday forenoon, March 12: Vitrified Brick Pavements: "The Construction of Vitrified Brick Pavements," by S. W. Jackson, Assistant Engineer; "Classifying, Testing and Inspecting of all Types of Construction Materials," by H. S. Mattimore, Engineer of Tests.

Friday afternoon, March 12: "Cooperation between Engineers and Contractors," by Aldrich Durant, Chief Engineer, MacArthur Brothers Co.

Superintendents' Meeting

Friday afternoon, March 12: W. A. Van Duzer, Assistant Maintenance Engineer, presiding; Presentation of State Highway Commissioner L. S. Sadler; Address by State Highway

Commissioner, Geo. H. Biles; "The Application of the Principles of Industrial Organization and Management to the Work of the Department," by G. G. Hatter, Executive Manager; "The Resurfacing and Surface Treatment of Macadam Roads," by W. S. Hammaker, Maintenance Inspector.

Saturday forenoon, March 13: "Maintaining Public Confidence," by M. H. James, Director, Extension Bureau, U. S. Bureau of Public Roads; "General Discussion of the Methods of Auditing and Accounting of the Department," by W. R. Main, Comptroller; "The Payment of Labor," by G. D. Swingley, Paymaster.

Saturday afternoon, March 13: "The Operation and Repair of Road Equipment," by F. O. Ewell, Mechanician; "The Purchase of Materials and Supplies," by C. H. Moore, Assistant Purchasing Agent.

Texas Bituminous Road Builders' Association

A number of Texas contractors who do bituminous work met at the Driskill Hotel at Austin, on March 1 and 2, and organized the Texas Bituminous Road Builders' Association.

The object of the association is: "To do all in its power to improve standards and methods of construction of bituminous topped roads in Texas, and to distribute literature and other information to all persons interested in this class of construction; encourage the adoption of standard specifications by counties and cities; and to generally place this form of construction upon a higher plane."

The association went on record as requesting engineers not to ask for bids on bituminous surfacing on roads not properly drained; of not at least 8 in. depth macadam, shell or gravel; and of not at least 16 ft. in width.

There were present representatives of Montgomery & Robertson, San Antonio, J. H. Kampman, San Antonio; J. E. Ward, Dallas; Finley Method Company, Houston; H. K. McCollum, Forth Worth; Texas Road Company, Dallas; J. H. Briggs, San Antonio; Haden & Austin, Houston; Houston Construction Company, Houston.

PERSONAL MENTION

G. Otter has been appointed county engineer of Ashland County, Ohio.

B. W. Sheldon was recently appointed highway commissioner of Keith County, Nebraska.

B. F. Umland has succeeded Glenn Martz as highway engineer of Pennsylvania County, Minnesota.

H. A. Rand has succeeded H. C. Compton as county road master of Clackamas County, Oregon.

H. H. Barnett has resigned as city engineer of Pontiac, Mich., and has entered private practice.

T. S. Brindle has succeeded H. D. Bruning as chief engineer of the Ohio State Highway Department.

P. M. Lau has resigned as highway engineer of Okland County, Michigan, to enter contracting work.

McClendon & Purnell of Mineral Wells, Texas, have been retained as county engineers for Morris County.

L. J Lenhardt, formerly with the engineering department of Detroit, Mich., has succeeded H. H. Barnett as city engineer of Pontiac, Mich.

F. M. Percival, County Surveyor of Aransas County, Texas, has been appointed county engineer of that county. The county recently voted a $100,000 bond issue for roads.

H. C. Compton, formerly County Road Master of Clackamas County, Oregon, has been appointed a district highway engineer of the State Highway Department of that state.

J. H. Briggs has resigned his position with the Southwest Bithulithic Co., and has entered the contracting business. He will specialize on bituminous topping and penetration macadam.

Richard F. Clough has succeeded E. B. Edwards as Texas representative of the Kinney Manufacturing Co., of Boston, Mass., and has opened offices in the Union National Bank Bldg., Houston.

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Highway Legislation in New York

(Concluded from page 150)

ways other than state routes shall be borne 35% by the state and 30% by the county.

No. 109, introduced in the Senate on January 20 by Mr. Hewitt, provides that state and county highways may be constructed of additional width and at increased cost at the expense of the county.

Three bills relative to snow removal and the maintenance of "winter roads" have been introduced, two in the Senate and one in the Assembly.

No. 352, introduced in the Senate on February 9 by Mr. Pitcher, authorizes the highway commissioner to designate any state or county highway as a "winter road" and empowers him to remove snow and ice, the cost being a part of the maintenance charge.

No. 454, introduced in the Senate on February 11 by Mr. Towner, requires the state highway commissioner, instead of the town superintendents, to remove snow from state and county highways.

No. 736, introduced in the Assembly on February 19 by Mr. Blodgett, authorizes the board of supervisors of the county, with the approval of the state highway commissioner, to designate state or county highways between important cities or villages as motor routes to be kept open during the winter, and provides that the work shall be performed by the town superintendent, and paid for with county funds.

Among the other bills introduced were the following:

No. 114, introduced in the Senate on January 20 by Mr. Pitcher, makes it necessary to obtain permits from town superintendents for the cultivation of land and the removal of trees within the limits of public highways.

No. 113, introduced in the Senate on January 20 by Mr. Pitcher, provides that town superintendents and their deputies shall be paid not less than $4 and not more than $7 per day, instead of from $2 to $5, as at present.

No. 184, introduced in the Senate on January 26 by Mr. Ferris, prohibits driving on public highways outside of cities a motor truck or a trailer having a width of body, including the load, of more than 8 ft.; a height from the pavement to the top of vehicle or load of more than 12 ft. 6 in.; or having a combined weight of truck and load of more than 25,000 lb. It also provides that the load shall be so distributed that there shall be not more than 800 lb. per in. width of tire on any wheel.

No. 538, introduced in the Senate on February 17 by Mr. Towner provides for the construction of 8-ft. roads for horse-drawn traffic alongside of state or county highways on vote of a majority of the county board of supervisors.

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THE HIGHWAY CONTRACTOR AND ROAD BUILDER

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Fundamentals of Early Highway Construction, and Are We Neglecting Them?*

By H. G. SHIRLEY

Secretary, Highway Industries Association

It is very often said that Cyrus and Bonaparte were the fathers of good roads but a close research as to the beginning of good roads will lead us back to the very beginning of all things and there we find the first Great Road Builder.

It has been surmised by some that when man and his better-half were driven from the Garden of Eden, there was a pathway or road over which they took their sad departure. The speaker has not been able to find any authentic account of this road, but very likely it was there.

The first account of road building was about 4,000 B. C., being that of a road built in conjuction with the construction of the pyramids. In 1900 B. C., roads were constructed in Assyria, the markings of which may be seen today in Babylonia leading out of Bagdad, as well as a number of bridges constructed about the same period over the Euphrates, which are in a very good state of preservation today.

The roads of Babylon were constructed with a thick foundation of stone laid in mortar and the surface paved with brick grouted with asphaltum. We, therefore, see that stone, mortar, brick and asphaltum were used back in the very early days of road construction and there is considerable speculation by students of history as to the form and kind of brick, the wearing qualities of the stone and character of the cement and asphaltum used. Yet it is a self-evident fact that the very materials that we are dealing with today in the construction of our highways are practically the same materials that were used by the Babylonians in 1900 B. C. The problem at that time was the same as it is today, being one of commercial and military importance.

Cyrus built a great system of military roads principally for the use of horses and runners. The heaviest loads, so far as known, passing over these roads were chariots, yet they were built with a thick surfacing of large stones and in many instances paved with square stone blocks.

The Appian Way, built 312 B. C. and designed for military purposes, was straight and when necessary to secure good alignment, tunnels, heavy cuts, tall embankments and retaining walls were constructed. The foundation stones for the surfacing were about 8 in. thick and generally of local materials.

The second course, 8 in. thick, was made of stones about the size of a hen's egg. On top of this a pavement of stone blocks was laid and fitted closely together. Very often the courses were laid in mortar.

The elements of the early Roman roads from which we can learn a lesson, are the alignment, which was practically straight, the great amount of work done, such as tunnelling, embankments and retaining walls to get a fair grade, the thickness and width of the surfacing to properly carry the traffic.

Highway legislation enacted by the Romans continues to be the basis of our road legislation. It made the road the property of all the people for their common use, built and maintained at public expense. The problem we are facing today is very much as it was in those days, only many times larger. The method of supplying the money from the general tax levy on all taxable property for the construction of roads, found most feasible in those days, still remains the same today.

The tendency in many states to use all the motor license fees for the construction is dangerous. The use of such fees should be first applied to the maintenance of roads and if there should be any money left after maintenance has been properly taken care of, this should be applied to construction.

The ancient road official was held in high esteem, being a man of importance and standing in his community and one of the most honored and highest officials in the government. This is quite in contrast with the position of our highway officials of today. The President of the American Association of State Highway Officials said in his address at Louisville, Kentucky, that the average term of the highway officials of this country was only two and three-quarters years. This shows very conclusively the regard the American people have for the experience, ability and loyalty of our highway officials. Not until our highway officials are held in the same high esteem as the highway officials were held in the earlier days, will this country profit by the continued able services and experience of our best highway engineers.

After the overthrow of Rome, the great system of military roads was allowed to deteriorate and go to pieces, very little attention being given to repairs.

In 1285 England, during the dark ages, passed a law requiring all bushes to be cut back from the highways for a distance of 200 ft. on either side, so as to protect the traveling public from robbers and bandits. Today, we have in this country, many miles of roads with the bushes growing almost over them and it is with effort that a team passes along, the briers and bushes practically obstructing the roadway. What an improvement it would be if a law could be passed requiring our roads to be properly brambled and all the bushes that interfere with traffic removed.

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*Paper presented at the 17th annual convention of the American Road Builders' Association, Louisville, Ky., Feb. 9-13, 1920.

In 1555 England passed an act providing for the working out of the road tax—four days each year of eight hours each. Many are of the opinion that the 8-hour day is of recent origin, but we find that it started many years ago. The working out of the road tax was passed on from England to this country and in some few instances is being used yet, but I am happy to say that this one great drawback to road construction and maintenance has been practically abandoned and a better system substituted.

In 1669, Louis XIV issued an edict that was the foundation of the French road system. The roads of France were built practically by compulsory labor until Turgot did away with the compulsory system, and it was necessary for Tresaguet, Chief Engineer of France, to develop a new system of operation and construction. He made the first coruse parallel with the surface and on edge, and on top of this he laid a second course of broken stone and a third course of smaller stone. He was careful to see that the top course was of a good hard quality. This was really the beginning of the great system of French roads.

We can draw quite a conclusion from a careful study of the construction shown and especially from the thickness of the surface crust and the substantial foundations provided.

In 1800, Napoleon Bonaparte established the Department of Roads and Bridges of France that is still in existence and has done such wonderful work. John McAdam, about this period introduced the macadam type of construction which came into general use. This type, and Telford construction revolutionized road building.

As to American highways, the first we have any authentic report of were built in Peru of stones about 10 ft. square and bounded on the edges by trees. In 1663 we find certain streets in Boston and New York that were paved with cobblestones. Braddock, in 1775, when marching through the country, cut out and graded a number of military roads while fighting against the French and Indians.

In 1792 the first turnpike was constructed, being the old Lancaster Pike from Lancaster, Pa., to Philadelphia. This road was built of large stones thrown into the road and covered up with earth. The earth soon washed off and the stones were later covered with broken stone. In 1800 turnpike companies sprang up all over the country and were incorporated and roads built in a number of states. They were chartered under the state laws, and toll gates were placed at certain intervals to collect tolls to provide for their upkeep. Many of these turnpikes are in existence today, but have been taken over by the states and the toll gates eliminated. They served a good purpose and were great instruments in encouraging a more rapid development and bringing material wealth to the sections they served

We can study their construction and financing with profit. In many instances, this work was undertaken with no idea of profit, but for the good that would be rendered to the community through which the turnpikes passed. These men were pioneers in the road building of this country, and we owe them a great debt of gratitude.

Most of the roads were constructed with a right of way of 66 ft. or more, graded to a width of 30 ft. and surfaced 18 to 20 ft., and with thickness of metal of from 18 in. in the middle to 12 in. on the sides.

In 1806 the Federal Government started the National Road. This road ran from Cumberland to St. Louis and had a right of way of 66 ft., graded 30 ft wide, a stone surfacing of 20 ft., 18 in. thick in the middle and 12 in. on the sides. This road was constructed for commercial use and plainly demonstrates that the United States Government at that day realized the possibilities of the development of the Ohio and Mississippi Valleys. Products were brought from this region to Cumberland and from there shipped over the Chesapeake and Ohio Canal to Georgetown and other sections. The people of Maryland and the City of Baltimore, realizing the advantage Georgetown and Alexandria would have over Baltimore as a terminus of the national road, constructed a road from Cumberland through to Baltimore. This road was laid out and built by the same engineers who built the Old National Pike and was of similar construction.

The speaker believes that it would be profitable at this point, for us to examine the fundamentals and characteristics of these ancient and early roads, with a view of studying the elements of engineering and construction used and what profit can be gained by such a study. We note that the ancient roads, such as those of Rome, were built with a great regard for alignment and grades, it being necessary to construct tunnels, large embankments and cuts, retaining walls, etc., to accomplish these results.

When we look into the foundation of the surface crust we see that even in those days, when there could not have been any heavy vehicles using the road exceedingly thick and stable foundations were used—very much heavier than were being used in this country at any period of its history and very much heavier than are being used today under a traffic that must be at least three or four times as heavy and with a volume that exceeds the traffic of that day many hundred times. The width of the Roman roads averaged 36 to 40 ft. and the national roads of this country, and the turnpikes, averaged from 66 to 100 ft. The drainage, construction and general engineering of the entire road were done with great care and thought and a great deal of time and investigation was naturally given to proper alignment and surfacing and the details of construction. Just at this point the speaker believes that it is very necessary that we should examine the reasons for the thick surfacing used in the early highways, and if we cannot profit by this examination. We hear much of standardization and standard sections for construction, the tendency of the present day being to use the same thickness of slab on the sands of Delaware and New Jersey, across the gumbo soils of Illinois and through the shale mountains of Wyoming, on to the coast, no regard or study being given to the sub-soil foundation and the same thickness of slab being used on sandy soils as is being used over gumbo, regardless of the stability of the soil or its ability to carry a load at ceratin periods of the year.

Not until there has been a plan of operation put into effect whereby a more thorough study will be made of the bearing power of the foundation soil on every mile of road, and the thickness of the road surfacing designed to meet the varied conditions of the soil encountered, will we have an economic and proper design of our highways. Nor will we have them constructed so that they will carry the traffic at the least cost.

We all realize that it will be impossible, with the present cost of labor and materials, to build the thick road surfacing that was used in the early times and it is, therefore, necessary that we meet in some other way the soil conditions, as it is absolutely essential that the stability of the foundation be guaranteed.

In an examination of the great damage done by exceedingly heavy traffic during the war, over thin surfaced roads, it was found that at least 97% of the failures were due to the softening of the foundation and the inability of the thin surface crust to carry the load over the soft and yielding sub-soil under it.

Experiments and test must be made and some simple method worked out whereby an inspector on the job can make a test of the soil and determine the thickness of the road surface which should be used to safely carry the heaviest load allowed under the laws over this foundation at the most critical period of the year and when it is in its weakest condition.

When we have arrived at this point, then the highways of America will be designed to meet most efficiently the requirements of traffic, and be constructed at the least cost. I wish also to bring to your attention the necessity of using material closely available, for in many instances we find local material that if properly used would provide a most excellent road and greatly relieve transportation congestion. But until we have determined the thickness of the surfacing required over different types of soils, it will be impossible to use, to the best advantage, the road materials that are found in this country.

In conclusion, the speaker wishes to emphasize the following points, and believes that the highway engineers and road builders of the country can look back and study with profit the alignment and proper laying out of the roads in which there should be a careful study made as to the advantage a direct alignment would be over a circuitous route and the savings that would be brought about in the shortening of the distance due to the large volume of traffic that may go over the road. It will be necessary to ascertain the additional cost to transport a load over a heavy grade as compared to the more circuitous route and the greater length of road, as well as the cost of construction of each route. With these and many other known factors involved, it could be easily ascertained which of the routes would be the most economical in the long run.

Due regard should be given to the foundation soils, drainage, natural beauty and views from the road, and how the climatic conditions, such as snow and ice, would affect its maintenance and use.

A study of the thickness and width of surfacing necessary to carry the traffic, the width of the right of way and the most economical durable type of construction should be carefully made.

The Arkansas Road Program*

By WM. B. OWEN†

Arkansas! The name carries a new meaning in these days of progress and development. In the olden days, it must be admitted, the name was seldom mentioned by the uninformed save in derision, associated only with "The Arkansaw Traveler" and "The Slow Train Through Arkansas;" a state supposed to be easy-going, slow, careless and non-progressive, without ambition or natural resources; a state whose people were popularly supposed to live only in the present, forgetful of the past and careless of the future, whose whole conception of life consisted of "red licker," "coon skins" and "fiddles.'

In the earlier days such yarns were told of Arkansas and readily believed by many because the people of the state, being independent and caring but little what the world might think of them, failed to deny the charges. Hence, these fictions became fact to those who knew no better, and who had no disposition to learn the truth. Then came a new day. The people of Arkansas became conscious of their own powers and resources and developed a state pride which has, within recent years, effectually set at rest the slanders spoken and written against the state. The log cabin has disappeared and industry along the most constructive modern lines is taking possession of every corner of Arkansas and foreign capital is kindling the state with its rejuvenating energy.

In no particular has this new state policy been more thoroughly demonstrated than in the good roads program. For years that consisted only in agitation, education, state conventions and resolutions; but now it is being realized in a definite way.

It is the same people, whom the uninformed have misunderstood and slandered, who have authorized, by general law and special act of the Legislature, the issuance of $100,000,000 in bonds for highway improvement; who are planing to construct 8,500 mi. of improved highway, forming a system connecting all important points and all county seats, as well as making connection with all trans-state national highways; who have a vision of the future years and possibilities, which causes them to unite in a systematic program for the construction of roads that will provide an adequate motor truck transportation for the development of the interior and, at the same time, take care of all railroad congestion.

Of the 8,500 mi. of road, 3,600 mi. connect the county seats and important urban centers and 4,900 mi. are laterals, which serve as the connecting links providing transportation to interior sections not served by the railways. In laying out this program, through roads with interstate connections were given the greatest consideration, and the whole program is so planned as to be adequate for future years for generations to come.

In carrying out this program there is being issued more than $100,000,000 in bonds, nearly all of which have been sold or bargained for and the money delivered on most of them.

The State Highway Department, during the nine months ending Dec. 31, 1919, distributed in actual money a total of $440,000 of state aid among the various projects under construction in the state. This is in addition to $50,000 of the state highway funds appropriated to the purposes of the General Assembly, of which provision is made for the return of $20,000. This amount, or nearly $500,000, was paid out on estimates of roads actually constructed or under construction.

The available funds for state aid are practically exhausted at this time. There is still due about $75,000 from collectors throughout the state and an appeal has been made to them to make these payments as quickly as possible, that the work may not be hampered.

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[*] From "Arkansas Out of the Mud," the official publication of the Arkansas Department of State Lands, Highways and Improvements.

[†] State Highway Commissioner of Arkansas.

The South Carolina Good Roads Institute was organized by men in that state interested in road building, as a result of the road school held under the auspices of the three state colleges and the South Carolina State Highway Department on March 3 and 4. A secretary was appointed who will keep the members of the institute informed on current prices of cement, pipe culvert, stone, unit prices of construction work, etc. The program of the meeting was printed in "Good Roads" of Feb. 25.

Road Improvements in Allegheny County, Pennsylvania, involving an expenditure of $1,000,000 will be made during the coming season, according to an announcement made following a conference between the county and state highway officials. It is reported that the state has agreed to improve about 80 mi. of the Lincoln, William Penn and Perry Highways and the Freeport and Elkhorn Roads in the county. The state will also do all the work on the Carnot Road leading into Beaver County from Stoops Ferry; will take over the state road from Carrick through Castle Shannon to Library and complete a portion of the Butler Plank Road. Improvement of the Frankstown Avenue extension along the Verona car line was also taken under consideration.

Uniform Highway Signs

By R. A. MEEKER*

The increased use of the highways and the greatly enlarged area of travel have restored the highways of our country to the prominent place they held before the advent of the railroad. Therefore, it becomes much more necessary that the names of the places reached by the road shall be clearly and legibly marked. The motor vehicle, with its wide range of travel, carries the driver far beyond the section with which he is familiar; hence direction and precautionary sign are absolutely necessary.

In order that these may render the best service possible, they should be clear, sharp, distinct, properly placed and durable. To this end the letters, figures and symbols should be plain, simple and widely spaced. No ornaments, scrolls or shading should be used The letters should not be crowded; hence, the signs should be large enough to permit of proper spacing and the symbols should be as few as are consistent with the needs of the traveler. The objection to the use of symbols has arisen from their number and the lack of distinctive character. A symbol should be so obvious in form that once seen and understood it will forever after be recognized at a glance.

For the greatest benefit to the traveling public, the precautionary signs should be uniform throughout the country and they should be placed only at such points as are really dangerous, else they will soon lose their value. For example, a sharp curve symbol should never be placed on a curve flatter than 10 deg. because such a warning sign is misleading. The driver seeing such a signal for the first time naturally slows down, then he finds that the curve is so slight that it was not necessary to check his speed and the next sharp curve sign is, therefore, disregarded, though the curve is twice as sharp. As a result there may be a bad accident. The same principle applies to steep grade signs. These should never be placed at the top of grades of less than 7% if the traveler is to be adequately safeguarded not only against physical obstacles but also against his own mental processes. "As a man thinketh so is he," is as true today as when it was first uttered.

From the foregoing it is obvious that the location is as important as the design of the warning sign.

The height of the sign above the road should also be carefully considered. A warning sign should be placed high enough to be seen above the top of another machine drawn up on the side of the road, while the direction sign should be low enough to be read easily by an occupant of the vehicle without raising his head.

There is still another factor to be considered in sign construction; that is economy. The preparation and placing of signs on highways is very important, and in sparsely settled sections is too great a drain on the local treasury. Hence, this is a matter that should be attended to by the state. But as the number of signs required in any state is very large, the aggregate cost will be considerable, in fact, so high, that this fact will deter the authorities from proceeding with the much needed work. In cases of this class, the sign may be constructed entirely of wood. If more funds are available, however, cast iron or concrete will be much more durable and, in the end, less expensive.

There is another matter on the line of economy that should not be overlooked. That is the necessity for enacting adequate legislation for the protection of the signs from defacement and destruction. Some persons seem to be possessed of a strange propensity to destroy and deface signs erected for the benefit of the traveler. These should be restrained from such acts of vandalism by uniformly stringent penalties. Every state should embody in its highway legislation a section making it a misdemeanor to deface or destroy any direction or precautionary sign erected under its authority on any public highway.

Pavements on the Lincoln Highway

Classification and Mileages by States of Types of Pavements on the Lincoln Highway between the Cities of New York and San Francisco, as of March 1, 1920

On the 3,223 mi. of the Lincoln Highway between New York City and San Francisco, there are 801 mi. classed as graded dirt, 749 mi. classed as graded gravel, 244.5 mi. classed as natural dirt, 207.2 mi. classed as natural gravel, 17 mi. classed as shale and 13.2 mi. classed as sand. The remainder of the route is paved or macadamized, the different types of surfacing and the mileages being as follows: Bituminous macadam, 406.3; concrete, 317.0; brick, 197.8; macadam, 175; asphalt, 80.6; granite block, 7.8 and creosoted wood block, 6.6. These figures are for March 1, 1920, and were furnished "Good Roads" by the Lincoln Highway Association.

In the foregoing classification, as well as in that arranged by states, the following explanation, supplied by Vice President Bement of the association, should be noted:

"In order to simplify the table, we have classified all forms of concrete construction under one head, 'concrete.' This, therefore, includes one and two-course concrete construction, and whether reinforced or not or bituminously treated or not.

"'Asphalt' refers only to sheet asphalt and in the table is practically all represented by city street paving traversed by the Lincoln Highway through the many municipalities. Much of the total brick mileage is also brick streets in cities.

"'Macadam' refers to all forms of macadam with the exception of bitulithic or bituminous macadam. Any macadam treated with anything besides water is included under 'bituminous macadam'."

The mileages of the different types, by states, are as follows:

New Jersey: Asphalt, 28.5; concrete, 21.2; granite block, 7.8; creosoted block, 3.6; brick, 1.9; total 63.0.

Pennsylvania: Bituminous macadam, 266.3; brick, 40.3; asphalt, 28.0; concrete, 19.7; graded dirt, 14.0; creosoted block, 3.0; total, 371.3.

Ohio: Brick, 85.3; macadam, 73.5; bituminous macadam, 54.0; graded dirt, 19.9; concrete, 8.9; total 241.8.

Indiana: Concrete, 54.4; graded gravel, 45.0; macadam, 31.0; brick, 28.0; asphalt, 6.0; total, 164.4.

Illinois: Concrete, 75.8; graded gravel, 32.2; brick, 18.4; graded dirt, 17.2; macadam, 13.5; asphalt, 5.3; total, 162.4.

Iowa: Graded dirt, 260.1; graded gravel, 106.5; brick, 15.2; concrete, 4.9; asphalt, 4.1; total, 390.8.

Nebraska: Graded dirt, 313.2; graded gravel, 108.4; concrete, 9.6; light sand, 9.2; brick, 8.5; natural gravel, 8.0; bituminous macadam, 7.1; asphalt, 2.9; total, 466.9.

Wyoming: Graded gravel, 193.1; graded dirt, 114.6; natural dirt, 92.5; natural gravel, 31.0; shale, 15.0; concrete, 0.3; total, 466.5.

Utah: Graded gravel, 54.8; natural dirt, 51.0; macadam, 40.2; natural gravel, 26.0; graded dirt, 24.0; bituminous macadam, 9.5; concrete, 7.9; sand, 4.0; asphalt, 2.0; total, 221.4.

Nevada: Graded gravel, 182.7; natural gravel, 133.9; natural dirt, 101.0; graded dirt, 22.0; macadam, 12.5; concrete, 6.0; asphalt, 0.8; total, 458.9.

California: Concrete, 108.3; bituminous macadam, 69.4; graded gravel, 26.3; graded dirt, 16.0; natural gravel, 8.3; macadam, 4.3; asphalt, 3.0; total, 235.6.

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*Consulting Engineer, Newark, N. J.; formerly State Highway Engineer of New Jersey.

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

Founded January, 1892

E. L. POWERS
Editor

T. A. HULBERT
Managing Editor

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Copy for advertisements must reach the New York office by noon on Tuesday of the week before date of issue if proofs are to be submitted.

Copy for classified and other advertisements where proofs are not required will be accepted until noon on Monday of the week of issue.

Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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Vol. XVIV MARCH 24, 1920 No. 12

WHERE TO SPEND THE MONEY

The question asked and the answer suggested in a letter from a county highway official elsewhere in this issue sum up about the most important question with which highway officials have to deal.

"Given a definite amount of money," says our correspondent, "which is preferable—to build a small amount of high grade roads or a larger mileage of roads of lower grade?"

The only justifiable answer is, of course, that it depends upon the conditions in the locality in question. In some places a very small mileage of expensive hard-surfaced pavement might be the solution. In another locality, perhaps within a few miles of the first, the answer might be a comparatively cheap improvement of the entire road mileage. In most cases, naturally, the wise course would lie somewhere between these two extremes.

While there are many factors that should be considered in deciding where to expend the road fund of a town, county or state—and many more that, unfortunately, often have undue weight—the governing factor in most cases should be the amount and character of the traffic the road will carry if, or when, improved. The public highways constitute one—and a very important—facility for the conduct of the public business. Those responsible for them should view them in that light, should look upon them just as the manager of a business looks upon the facilities for carrying on that business. Fundamentally, the same considerations should govern a highway official's decision as to the amount of money to spend upon a given road as govern a railway executive in fixing the amount to spend on a given trackage or as govern a factory manager in determining how much he is justified in spending for the purchase of new machinery or for other improvements or enlargements calculated to increase the output and the profits of the shop.

Until this view is generally adopted, road funds will not be expended to the maximum benefit of the community.

ROAD SIGNS

In the old days when travel over the highways was solely by horse-drawn vehicles, there was little need of direction signs and none of cautionary signs. The distances covered were short and, for the most part, the routes were thoroughly well known to the drivers. The dangers of the road, except at railroad grade crossings, were few.

All this was changed by the coming of the automobile and the motor truck. Hundreds of miles are covered now where tens used to be covered. Drivers are frequently in country that is new to them, often on roads that they know nothing about. And the crooked, hilly roads that were quite safe for light, slow vehicles drawn by horses are sources of constant danger to heavy, fast motor-driven vehicles.

These changed conditions give rise to a very urgent need of both direction and cautionary signs, and praiseworthy efforts are being made to meet that need in many localities. The results of these efforts are not always what they should be, however, largely because of a failure to give adequate study to what the traveling public requires of signs.

Elsewhere in this number, in an article by former State Highway Engineer Meeker of New Jersey, there are some common-sense suggestions relative to the design and placing of road signs.

The first point emphasized by Mr. Meeker is simplicity of design. The function of either a direction or cautionary sign is strictly utilitarian and it should not be cluttered up with ornamentation or anything more than that words or symbols necessary to give the desired information to the traveler. The letters should be large and plain and should be widely enough spaced to be easily and quickly read. These details of design are especially important, because the signs should be sufficiently clear to permit their being read by a driver without having to stop his car. For the same reason they should be placed in correct positions and at the proper distance from and the proper height above the road.

Another particularly important point made by Mr. Meeker is that cautionary signs should be used only where there is real need of exercising unusual caution. There are still many dangerous places in our roads that lack such signs, but there are also hundreds of these signs where they are not needed. And warnings in places where there is no real danger are worse than useless; they are really sources of danger. After a driver has reduced speed, hugged his own side of the road too closely for comfort and exercised unusual care because of a few misplaced signs he looses his belief in them and pays little or no attention to them. The result is likely to be an accident that is partly due to the poor judgment exercised in the placing of the signs.

Under present traffic conditions the erection of both direction and warning signs—especially, perhaps, the latter—is as much a part of the duty of the road authorities having jurisdiction as is the building and upkeep of the roads. It should also be a part of their duty, and within their power, to exercise a careful supervision over the erection of signs by private interests. There are many of this kind of markers and warnings along the public roads, and while most of them are distinctly useful some are improperly worded and located and, therefore, misleading and even dangerous.

Lastly, as Mr. Meeker points out, there should be adequate laws against destroying or tampering with road signs. These laws should protect all road signs and should be vigorously enforced.

LETTER TO THE EDITOR

Improved Roads from the County Official's Standpoint

Editor, "Good Roads:"

Given a definite amount of money for highway work, which is preferable, to build a small amount of high grade roads or a larger mileage of roads of lower grade? That is the problem that stands out most prominently in road work just now, in this county, in this state, and in other states.

The question written out, prompts at once the answer: "The road that is the best value for the money." But to say which kind of road that is, is not so easy.

Quoting from a recent magazine article: "Transportation is measured in ton-miles, hence the production of a ton-mile at a minimum cost is a desideratum. The cost per ton-mile is derived by dividing the total annual cost by total ton mileage, and the annual cost is made up of the annual cost of roadbed, the annual cost of power and the annual cost of vehicles."

Right, but the highway official should include in his problem not only the improved roads, but all the roads under his jurisdiction. He should improve the roads that carry the bulk of the travel in proportion to the amount of the travel, and should consider all roads in his district as entering into his ton-mile problem. In other words, the highway official owes a duty to unimproved as well as improved roads. The cost per ton-mile should be considered on all the roads. In the average country districts, not more than 25% of the roads can be improved, because of the cost. I was told once by a taxpayer that every road in his town should be built, "just as good as that," pointing to a half-mile stretch of good brick road running to the railroad station. Now there were 60 mi. of road in his town, with about 6 improved, mostly macadam, and the assessed valuation of his town was about $800,000.

I told him he could have the brick road everywhere if he would arrange to tax his town an amount equal to the entire valuation of the property in his town and keep it up for two years, and I am afraid I discouraged him.

The county highway official should have vision enough to plan a system of roads that will reach out, subdividing like tree branches, until every section of his county is covered. That will constitute 25% of his mileage and carry 90% of the ton-mileage travel. In this county, with 1,490 mi. of road, we have now 220 mi. improved. Our map calls for 175 mi. more of improvement. We tax ourself on an average (the rate varies in different towns) $7.45 on the thousand for road purposes, including bridges, our county share of state roads, and all items connected with road work.

Yet with this fund, and building the lower grade type of road that we are, it will take six or seven years more to complete our map. If we adopt a type of road at double the cost we will either have to have more money or take twice as long, and during this time the ton-mile cost on the earth roads, admitted to be much higher, will continue.

So this is a factor that enters into the answer of what type of road is the best value for the money. I like to ride in a Packard or Pierce-Arrow car, it give one such a sense of wealth and superiority, it rides so comfortably. One of those may be the best value for the money, but I drive a Ford, chiefly because I can afford that. "It takes you there and it brings you back" and lots of us believe it is good value for the money.

As I see it, for this county there are but three types to be considered—water-bound macadam, regularly oiled and coated; bituminous macadam; and concrete. Gravel roads I dismiss. They are worth what they cost, as minor improvement, but our experience has shown that under present heavy travel conditions they do not stand up. Some sections, notably Massachusetts and New Hampshire, have built and regularly oiled gravel roads, but those I have seen incline me to the belief that they are not the best value for the money and that it would have been better judgment to apply the oil on stone macadam, especially so in a district like ours where stone is easily obtainable locally for road work.

Concrete, on the other hand, is like the Packard car, highly expensive to start with, giving a sense of wealth and superiority, but, with our county funds, beyond our means.

No one can say yet that the concrete road is a permanent road. The 1:3:5 mixes of five years ago were failures. The one in this county has been covered over with a bituminous top and none of the 1:1-½:3 roads have been built long enough to prove the point.

That eliminates for us all but the water-bound or bituminous type. Wm. D. Sohier, Ex-chairman of the Massachusetts Highway Commission, in recent article said:

"In Massachusetts there are many miles of water-bound macadam from 15 to more than 20 years old, scattered around in all sections, which have never been resurfaced but have been maintained with a bituminous blanket top and constant patching. Others have been satisfactorily maintained by putting a thin mixture of sand and asphalt on top and widening the shoulders with the same material, only 3 or 4 in. in depth, at the same time diminishing the crown."

Coming back home, the second stone road built in this county in 1907 was a water-bound macadam. It has been oiled and treated with stone chips, but has never been resurfaced. It looks its worst now, but that is because it did not get its oil treatment, being scheduled for resurfacing and not reached. It has been good value for the money.

The Genesee Turnpike is a water-bound road from Aurelius to Cayuga, built from 1911 on, in sections, as funds permitted each year. In 1917, Clark St. Road was resurfaced and the Turnpike water-bound road took the Trunk Line No. 6 travel amounting to close to 2,000 vehicles a day. At the end of the season it showed the wear. It was patched and oiled with stone chips and oiled again in 1919 and was in good condition in the fall. It has been good value for the money it cost.

The road improvements we have had are worth all they cost. We have had their use for years. If we were starting now and the problem was to finance the 220 mi. of improved road we have, at $40,000 per mile, would we ever get started on a $9,000,000 schedule, one-fifth of our assessed valuation? Doubtful.

J. CHARLES DAYTON,
County Superintendent of
Highways of Cayuga Co.,
Auburn, N. Y. New York.

———ooo———

Utah Spends the Largest Per Capita Amount for highways of any state in this country, it is stated, the figure being in the neighborhood of $22.

Massachusetts Highway Association

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Announcement

This section of the paper is open to members of the Massachusetts Highway Association for the discussion of matters directly connected with road interests. Members are requested to submit items of interest for use in this column.

Address all communications to GOOD ROADS, P. O. Box 2705, Boston.

News and Gossip

Massachusetts has suffered with the rest of New England from a series of snow storms following each other closely and successfully stopping practically every means of transportation.

Traffic on highways was in process of being resumed after the first storms, but when the last blizzard came and left an extra 8 in. of snow the roads were buried, the electric car lines went out of business and the railroads struggled with snowplows and occasionally ran a few trains.

And now when the snow and ice are fast disappearing and traffic conditions are nearly normal, there are only memories of the snow banks and large holes in the appropriations of the street departments of every city and town.

Complete figures are not available at this time, but the City of Boston has paid out over $650,000 and the accounts are not all in.

Everywhere there is the same complaint and that is, the lack of mechanical apparatus for handling and removing snow and ice from city streets and country highways.

A few years ago when shovelers were to be had everywhere and would work for $1.25 per day, the problem was not so serious or so expensive, but with laborers being paid 60 ct. to $1.00 per hour, and scarce even at that price, the matter assumes serious proportions and the only remedy seems to be properly designed machinery to take the place of day labor.

The special equipment for fighting snow should be mechanical, especially in view of the labor shortage. Sweeping machines, flushing machines and snowplows should be driven by powerful motors and should be numerous enough to keep the main arteries of the city clear in any storm short of a blizzard. The expense would no doubt be considerable; but it would be mainly an initial expense, with little charge for upkeep. In comparison with the cost of the recent blockade, which must have been many thousand dollars, it would be negligible. Never again should a large city suffer the humiliation of lying prostrate for days and weeks after a snow storm.

Superintendent of Streets Edward J. Dunphy, of Cambridge, had equally as big a problem as did Boston's commissioner during the recent big storm. But "Eddie," who was a jeweler before his appointment by Mayor Quinn, kept the "wheels" going in spite of the difficulties he encountered.

When he found it impossible to use his automobile he got into his oldest suit of clothes and made the rounds of the city afoot. For many days he was the busiest official in sight, and his handling of the situation convinced everybody that he was the right man for the job when the right man was needed.

Snow storms this winter have cost the City of Boston to date over $650,000. This figure is by far the largest in the city's history. The nearest approach was in 1898, when the cost of snow shoveling and carting to the city was $250,000.

A dozen contractors have been paid about $300,000 for snow removal this year, and the remainder, $350,000, has been paid out to city laborers and teamsters.

That the state owes it to industry to clear the main highways during the winter months was the contention of Senator Chamberlain, of Springfield, voiced before the legislative committee on roads and bridges at the hearing given his bill providing for authorization for the Department of Public Works to make provisions to keep highways passable at all times. He told the committee that in Pennsylvania, where the roads are kept open, it has been found that only half the usual expenditure for repairing the roads in the spring is needed.

Representative George A. Gilman, of Boston, also spoke in favor of the measure. He suggested that some such law as operates in Boston, by which the Elevated is required to remove from the streets an amount of snow equivalent to that removed from its tracks, be put into effect throughout the state.

The committee also heard the bill of the Highway Commission to limit the size of trucks and their loads to a length of 28 ft., a width of 96 in., and a height of 11 ft. Commissioner Cole told the committee that some such law was needed for public safety and that, incidentally, it would save the roads a considerable amount of over-burden.

Representatives of box manufacturers, building contractors, road builders, truckmen, wool merchants, market gardeners and lumber companies all opposed the bill on the grounds that it would seriously affect their business and even force some out of business.

Col. Thomas F. Sullivan, Commissioner of the Department of Public Works of Boston, has been wrestling with a law affecting the dumping of snow and ice from the streets into the harbor. John N. Cole, State Commissioner of Public Works, has informed Commissioner Sullivan that the city is not allowed to dump ice and snow containing more than 3% of mud into the harbor So here's another of those pesky 2.75% laws to contend with.

Preliminary surveys have been completed by the City of Medford's Riverside Avenue Commission for widening and building that roadway. It is planned to have the Elevated run a car line over the roadway bordering the Mystic River to the Fellsway line near Wellington Bridge, and then to Sullivan Square cutting down the running time about 10 minutes.

The survey and preliminary work have cost about $5,000 and the city will spend some $200,000 in the work before completion. At the meeting, plans showing what buildings will be affected by the widening, will be exhibited.

The town meeting in Needham on March 15 was the largest ever held in the town. The sum of $175 was appropriated for a World War Memorial and other appropriations were as follows:

Schools, $74,300; Board of Health, $2,200; library, $4,650; Poor Department, $11,500; Fire Department, $11,500; police, $6,400; street lights, $9,100; town debt, $27,000; suppression of moths, $3,960.

The town meeting held in Easton on March 15 made the following appropriations:

Town officers, $5,600; schools, $65,000; Board of Health, $1,800; highways and bridges, $20,000; Poor Department, $8,000; Fire Department, $600; police, $200; suppression of moths, $1,699.57; state aid, $1,500; Tree Department, $1,500; incidentals, $5,000; soldiers' relief $2,000.

At the last town meeting in Wakefield, general salary increases were granted. The voters ignored the recommendations of the Finance Committee and gave town officers much larger increases than the committee suggested. Chairman Warner V. Taylor of the Finance Committee changed his stand on increases before the meeting was over and moved that several other town officers be given raises.

Among the raises granted were $300 to the superintendent of streets; $200 to the fire chief, besides the $200 raise granted him last week; $100 to the inspector of plumbing; $200 to the town counsel; $200 to the collector of taxes, and $50 to the town clerk. It was decided to pay the permanent firemen $5.00 a day.

The end of the disagreements and differences which have retarded the construction of the Springfield-West Springfield Bridge over the Connecticut River, is in sight.

The bridge and approaches will cost approximately $4,000,000. It will be a reinforced concrete arch bridge with ornamental towers, and will join West Springfield with Springfield, replacing an old wooden toll bridge over 100 years old. The actual construction work will commence in the summer. According to present plans the building of the bridge will cover a period of 33 months. It is hoped to complete it by July 31, 1922. Fay, Spofford and Thorndike, of Boston, are the engineers.

The Board of Aldermen of the City of Medford have passed a resolution favoring increasing the city laborers' pay 50 ct. per day to a minimum of $4.50 per day.

For coordination of local public works the town of Reading will apply for legislation to establish a board of public works and dispense with the light, water and sewers commissions.

The annual appearance of an ordinance requiring abutters to remove snow from their sidewalks was given its annual death by the Board of Aldermen of the City of Melrose. Even the 10-ft. drifts which have blocked some sidewalks failed to make the aldermen change their attitude. The city will have to continue its care of sidewalks after snowstorms.

Mayor John V. Kimball, of Malden, has sent to the city government the annual budget calling for appropriations of $1,182,336 for the coming year. This is an increase of $86,350 over the amount contained in last year's budget.

Directors of the Waltham Chamber of Commerce have under consideration plans for the extension of the Metropolitan Boulevard along the banks of the Charles from the point of its present termination in Newton, along the shores of the river to Norumbega Park at Auburndale. This plan has been under consideration for many years, and has been much discussed by officials of Watertown, Waltham and Newton.

According to the chamber's plans, the boulevard would be continued from Maple Street, Newton, along the river shore, through Waltham and to a point near the Weston Bridge at Auburndale. The chamber is to appoint a special committee to take up the plans with the State Legislature and Metropolitan Park Commission officials.

Mayor Peters, of Boston, has appointed Maj. Geo. J. Cronin formerly of the Yankee Division, to be superintendent of the newly organized City Supply Department at a salary of $6,000 per year.

This office has been vacant since the mayor's summary removal of Thomas J. Dawson, on Nov. 21, 1919, in connection with the oil scandal.

City Collector Frank S. Deland has been looking after the supply department while a full score of candidates for the office were besieging the mayor's office with appeals from important political personages. Deland, according to one story, could have had the position, but he turned down the offer on the ground that he preferred to remain as city collector.

Since Dawson's removal, the mayor has had Stone & Webster make a study of the department. This company reported many recommendations for its improvement, which the mayor intends to have carried out by the new superintendent. The salary has been increased from $3,000 to $6,000.

Maj. Cronin was born in Boston, Jan. 15, 1886, and was graduated from the Bigelow Grammar School and the South Boston Evening High School and later from the Army General Staff College.

For the first three years after leaving school he was employed in the counting room of Chester Kent & Co., 221 Columbus Avenue. From November, 1904, to May 5, 1905, he was in the auditing department of the Jordan Marsh Co. From May 5, 1905, to March 27, 1917, he was in the local purchasing department of the Navy, being in charge of the department in the last six years of that period.

His war service was in the Army and lasted from from March 27, 1917, to May 9, 1919. During this time he was successively captain of Company D of the 101st Infantry, Yankee Division; captain of Company A, 306th Infantry; intelligence officer at the 77th Division headquarters and assistant chief of staff, with the rank of major, in charge of the intelligence section of the 77th Division. He was overseas 19 months.

On June 1, 1919 he became a buyer for the Bethlehem Shipbuilding Corporation, but resigned this position on Nov. 10 to become purchasing agent for the Gillette Safety Razor Co. He lives at 25 Peverell St., Dorchester.

The town of Lexington is facing a record tax rate of not less than $33, according to the Finance Committee, which makes this prediction in its annual report on the budget of town appropriations, which will be voted upon at the annual town meeting. The committee has made many cuts in its recommendations from the original amounts asked for, and an even higher rate will result if the recommendations of the committee are not sustained. The high tax rate is due, the committee states, to conditions of the times, with an adjustment of wages and salaries which at this time is absolutely necessary to meet the cost of living, and the increased cost of all materials and supplies. The committee recommends a total of $338,693 for the budget, as compared with last year's town grant of $282,456.

At a recent meeting of the Waltham City Council, City Manager H. F. Beal sent a communication in which he

(Continued on page 166)

New Hampshire Goods Roads Association

OFFICERS FOR 1920

WINFRED M. CHAPLIN, President	Keene
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Board of Directors

WILLIAM A. GROVER	Dover
H. W. SPAULDING	Manchester

Regardless of snow and ice and uncertainty and delays in all methods of transportation, some fifty members of the New Hampshire Good Roads Association were present at the annual meeting on March 11 in Concord.

The business meeting was held in the Chamber of Commerce rooms and the following officers were elected:

Winfred M. Chaplin, President, Keene; Wm. J. Morrison, Secretary and Treasurer, Keene; Harry L. Smith, First Vice President, Lakeport; Ozman W. Fernald, Second Vice President, Berlin; Board of Directors: William A. Grover, Dover; Harry W. Spaulding, Manchester.

Amendments to the by-laws covering the times of meeting were adopted, together with the amendment stating that officers together with past presidents shall constitute the board of government of the Association.

It was voted to pay the secretary of the association $25 a year.

During the morning session, John A. Whittaker, Senior Highway Engineer, U. S. Bureau of Public Roads, addressed the members. His topic was "The Federal Road Act, What It Is and What Is has Accomplished." The subject was a very interesting one and the speaker gave details showing how New Hampshire had benefitted through its operation.

On the adjournment of this session the members met at the Eagle Hotel for dinner which was served at one o'clock. State Highway Commissioner F. E. Everett presided and announced that a message had been received from Governor Bartlett expressing his regret at not being able to be present. Messrs. Whittemore and Whelpley of the Governor's Council were present, however, and spoke briefly.

Randolph Coolidge, of Boston addressed the members on the subject of road construction, emphasizing the necessity of preparing plans in advance so that various problems that must be considered could be decided before the actual mistakes of construction were made. Although Mr. Coolidge is himself an architect, his broad knowledge of highway problems gave added interest to his forceful plea for advance studies of road plans, by-passes that will permit through travel to avoid congested centers and snow removal. His idea in regard to the removal of snow was to make the actual traffic pay for the work, rather than to shift the burden to the community at large. He spoke very highly of the maintenance patrol system in New Hampshire, as developed by Commissioner Everett.

The principal address of the afternoon was given by Lieut. Joseph H. Killourby, of Laconia. The lieutenant gave a most interesting talk on his experiences overseas with the engineering forces. His duties took him to the Argonne and St. Mihiel and his descriptions of the enginering problems that confronted our forces at the front and the manner in which the troubles were overcome held the close attention of his audience. His experiences in road work abroad were especially interesting to the highway officials present.

At a meeting of the Laconia City Council in council chamber on Feb. 17 the books of the city were brought to a close for the fiscal year. Mayor John A. Mitchell presided and all the councilmen were present.

Included in the other business of the meeting a petition was received for a new highway on the west shore at The Weirs channel, and was referred to the committee on roads and bridges. It was voted to authorize the mayor to sell property held for taxes at auction or private sale. A resolution was passed, under suspension of the rules, to transfer to the highway and bridges account the following amounts: From the Olive Place drain account, $50; from the sewer maintenance account, $500; from the street sprinkling account, $272.72; from the Walnut Street drain account, $300; from the miscellaneous account, $2,722.57; and that the sum of $7,833.52 be transferred from the miscellaneous account to the highways and bridges to cover the cost of improvement of Canal Street.

The postponed hearing on the proposed waterway connecting the Merrimack and Piscataqua Rivers was held on Feb. 16 at city hall. Captain Gilbert Van B. Wilkes, of the United States Engineer Corps, presided. Oliver L. Frisbee, of the Atlantic Deeper Waterways Association, gave a clear outline of the proposed plan for the canal. Secretary Baker presented a brief in behalf of the chamber of commerce. Other written arguments were presented.

The construction of about 150 mi. of state highway in Maine is the program contemplated for this year, according to the annual report of the state highway commission. Surveys for this work have been completed and steps taken to have all the projects approved by the Federal Government for federal aid.

Registrations of automobiles for the New England States for 1918 and 1919 are given below:

	1918	1919	P. C. Increase
Connecticut	84,902	105,419	24.2
Maine	44,572	51,334	15.2
Massachusetts	193,497	250,800	29.6
New Hampshire	24,904	30,006	20.5
Rhode Island	30,595	42,000	37.3
Vermont	22,550	26,806	18.9

A series of heavy snow storms coming within a period of a few weeks practically tied up all means of transportation in New Hampshire. Highways were completely closed; railroad trains were stalled in all sections of the state; roofs of buildings were crushed under the weight of the snow; electric car lines were abandoned completely; in the country districts roads could be traced only by the lines of telegraph poles; and drifts 40 ft. deep were reported from various sections of the state.

Gradually the railroads were opened and then some of the through highway trunk lines. Volunteers to clear away snow worked hard in all sections in order to permit the movement of trains loaded with coal and food and no serious famine of the necessities of life has been reported. In several cases, however, there was extreme destitution, and some deaths were reported from farms that were isolated by the storms.

Within the past two weeks the larger cities have organized "Dig Out" days and with the warmer weather conditions are resuming normal.

The proclamation issued by the Mayor of Manchester is printed below:

The condition of the streets of Manchester, existing because of the abnormal storms and consequent accumulation of ice, is such that a thaw which may be reasonably expected at this time of the year would result in their being made impassable.

This would inevitably result in severe loss of business and cause thousands of dollars of damage through flooding of cellars in business places and residences.

The people of Manchester have always wholeheartedly responded to any call to participate in any movement for the good of the city; therefore, Tuesday, Mar. 9, is hereby set aside as "Municipal Dig-Out Day."

On this day, all citizens, corporations and business firms are requested to cooperate with the city in a general cleaning up of sidewalks and gutters. Each householder should make a special effort to provide drainage in front of his own home by digging a gutter one foot wide and to clear entrances to cesspools. The Manchester Chamber of Commerce is setting up a fine example in calling its members to action for the emergency.

Every city department will, therefore, take notice to discontinue all other work, where it is advisable of so doing, and to take the trucks, picks and shovel in all parts of the city, receive the cooperation of citizens and clear the streets and alleys from snow and ice.

Moise Verrette,
Mayor of Manchester.

About 3,000 citizens responded to this call and under the direction of Director of Public Works Shea and his Superintendent, Mr. Mendell, some 25 mi. of tracks, gutter and walks were cleared of snow.

New York State Road Builders' Association

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Crusher Run

Commissioner Frederick Stuart Greene, who was with General Pershing in France, was a guest at the luncheon which was given in General Pershing's honor at the Watervliet Arsenal.

Maj. Theron M. Ripley, who for six years has been division engineer at Watertown, has been removed by Commissioner Greene, and L. D. Bromwell, a reisdent engineer, with headquarters at Utica since last April, has been appointed to succed him. He has already been sworn into office at the office of the secretary of state.

No proposals were received at the last letting for the Bridge over Rondout Creek, between Kingston and Sleightburg.

To cover the increased cost of freight shipments and the cost of material and labor, the estimate on the contract for building the Rondout Bridge, has been raised $60,000, and leading bridge building firms in the East have given assurances that bids will be received from several firms on March 25. The bridge is expected to be open to the public on July 4, 1921.

The annual highway maintenance bill will carry a total this year of $7,500,000 which is just one-half the amount asked for the work by Commissioner Greene. This means one half repair program this year.

Fred E. Ellis, who has been taking a nice little trip through the South this winter, while his brother members of the Association have been trying to keep warm, certainly has been envied when they have read his "post cards," telling them he is "brushing away the flies," "wielding a palm leaf fan," "picking oranges," and taking "a nap in the shade of the linden tree."

We know "Fred" had a good time because he was accompanied by Harry "Thew" McLaughlin, and this gentlemen's companionship is enough to drive away the blues at any time of the year, be it in the North or South.

Highway superintendents and supervisors from virtually every county in the State of New York are in favor of the Knight Bill, which would apportion to counties for county road building 50% of the highway monies derived from automobile fees instead of 25% which is the present law.

Richard Hopkins, Chairman of the Membership Committee of the New York State Road Builders' Association, read a very able paper on "Labor Saving Devices," at the meeting of the American Road Builders' Association, at Louisville, Kentucky.

There were 20 roads advertised in the letting which took place at the New York State Highway Commission on Thursday, March 18. Thirteen of these roads were concrete, 6 bituminous macadam, and 1 water-bound macadam.

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News and Gossip

(Continnued from page 164)

recommended the erection of a new bridge across the Charles River at Moody St. For many years there has been sentiment in favor of a new bridge at this place, but always finance caused the agitation to end in only talk.

Manager Beal, in his note to the Council, says that the time has arrived for some action. He, therefore, suggests an appropriation of $2,000 for plans and specifications for a suitable bridge at this place. In former years the grade crossing at Moody St. proved an obstacle in any new bridge plan. From indications there does not appear to be the least chance of any steps being taken toward the abolition of this grade crossing. The order calling for the $2,000 was passed to a second reading.

The Council also passed the ordinance for the establishment of a permanent assessor. This will mean the abolition of the present office of public appraiser. The new building ordinances were gives their first reading. The body also passed several small appropriations to take care of old bills.

The Municipal Council of Attleboro received notice recently of Mayor Brady's first veto, which checks the attempt of the Council to limit the $100,000 on streets so that it can not be expended by the Mayor and Superintendent of Public Works, but may be spent by the Council, which is to determine the streets and types of construction.

The Council had also specified that a committee of five was to handle the street funds, and President Gaynor named Councilmen Sweeney, Foley, Allen, Clapp and C. A. Smith.

The mayor pointed out that the vote was in violation of the charter and filed an opinion of the city solicitor to that effect. Section 18 of the charter provides that neither the Municipal Council nor any member of any committee shall take part directly or indirectly in the employment of labor, the making of contracts or the purchase of supplies or materials for the city.

A two-third vote will be necessary to defeat the veto.

Superintendent Robert P. Marsh, of the Department of Streets and Engineering of Springfield, recently appointed Charles H. Restall, a civil engineer of Boston, engineer to fill the vacancy caused by the resignation of Harry L. Gray.

Laborers in the Lowell Street Department threaten a strike if they are not paid $5 a day. The appropriation for the year has been made by the Municipal Council, and the commissioner says that he is giving wages in accordance with the amount allowed the department.

At the recent town meeting, Milford appropriated $332,000, the largest amount in the history of the town. Patrick Fitzgerald was elected tree warden on a voice vote.

The appropriations: Schools, $118,913; Board of Health, $3,900; highways, $32,988; Poor Department, $25,518; Fire Department, $21,700; police, $8,500; street lights, $16,180; town debt, $23,500; suppression of moths, $500; water, $8,000; town incidentals, $5,000; Memorial Hall, $1,353; sidewalks, $450; Town Hall, $4,313; parks, $1,000; watering streets,

(Concluded on page 168)

EQUIPMENT—TRADE—MATERIALS

New Tractor-Grader

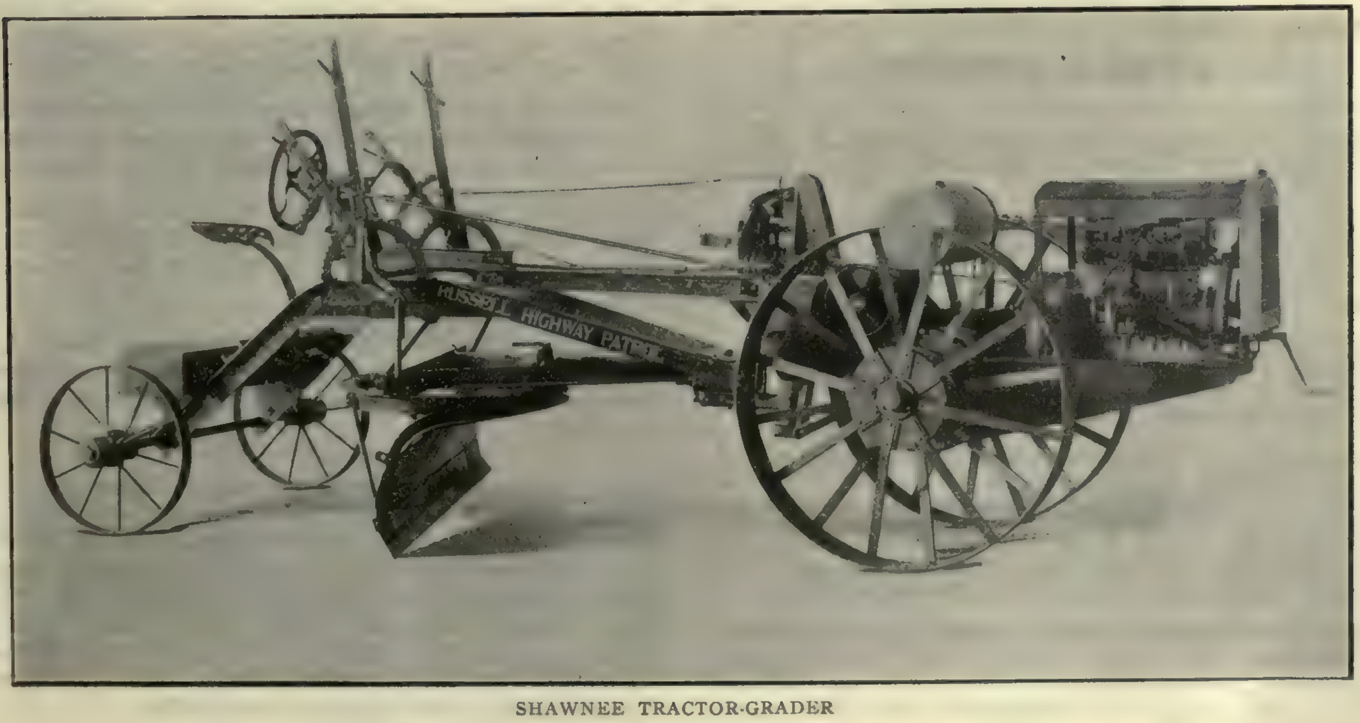
An unusual application of the tractor in road work is shown in the accompanying illustration of a 2-wheeled tractor coupled to a road grader of the type so extensively employed in both construction and maintenance.

The tractor itself consists of a heavy frame mounted on two driving wheels and carrying a 4-cylinder gasoline engine. The wheels are 48 in. in diameter, with 8-in. faces, and may be fitted with cleats or lugs. The machine has two speeds forward, 2½ and 4 mi. per hour, and one reverse speed, 2½ mi. per hour. Each wheel is driven by a large worm gear, the transmission, from the clutch shaft back to and including the spur gear driving the worm shaft, running in oil. The transmission case is a unit casting constituting the frame of the tractor and supporting the engine, thus insuring alignment of the working parts. The tractor weighs 2,600 lb. and has a gasoline tank of 10 gal. capacity.

The tractor and grader are known as the Shawnee tractor-grader, the tractor being manufactured by the Shaw-Enochs Tractor Co., of Minneapolis, Minn. The grader is a Russell highway patrol type, made by the Russell Grader Mfg. Co., also of Minneapolis.

The Portland Cement Association has opened an office in Portland, Ore., with Hans Mumm, Jr., in charge. Before becoming connected with the association in 1916, Mr. Mumm was city engineer of Everett, Wash.

A little booklet bearing the title, "Permanent Paving," has been recently issued by the Granite Paving Block Manufacturer's Association. Illustrations depicting pavements of granite blocks in various cities of this country are included, together with general information relative to this type of pavement.



SHAWNEE TRACTOR-GRADER

News and Gossip

(Concluded from page 167

$1,700; workmen's compensation fund, $1,200; state aid to Civil and Spanish War veterans, $3,600; soldiers' relief, $4,471.

We regret to announce the sudden death on Feb. 19 of Ralph A. Vickere, for the past eight years Superintendent of Streets of Providence, R. I.

Mr. Vickere went to Louisville, Ky., to attend the annual convention of the American Road Builders' Association, and while there was taken suddenly ill with nephritis. Great difficulty was experienced in securing a trained nurse, and although everything possible was done for him he died within a few hours.

Mrs. Vickere was with her husband at the Louisville Old Inn Hotel when he died. City Engineer Milton H. Bronsdon, who remained behind after the rest of the Providence party returned home, to care for his associate, was also with Mr. Vickere when the end came.

The news of Mr. Vickere's death was received in Providence with the deepest regret. Commissioner of Public Works Slade, under whom Mr. Vickere worked, was particularly affected.

"He was one of the most efficient and progressive officials we had," Mr. Slade said, "and in his death the city has sustained a real loss which it is going to be difficult to repair."

Mr. Vickere was born in Providence, Aug. 30, 1884, a son of Mr. and Mrs. Frank A. Vickere. He was educated in the public schools of the city and later took an engineering course at the Rhode Island State College.

He entered the employ of the city Apr. 24, 1905, as a student in the city engineer's office. About a year later he was employed by the N. Y., N. H. & H. R. R. on the engineering staff that built the East Side Tunnel.

After three years he returned to the employ of the city as an inspector in the Public Building Department. In November, 1912, he was made superintendent of highways in the Highway Department to succeed J. Henry Field, who had held the post for many years, but who had resigned. Since then Mr. Vickere has been in charge of the Highway Department.

PUBLICATIONS

SOILS OF NEBRASKA AS ROAD MATERIALS. Report of Nebraska State Highway Advisory Board. Paper, 6x9 in., 60 pages and covers, illustrated.

The report on road materials was prepared by G. E. Condra, Director of the Nevada Conservation and Soil Survey, and is a concise and comprehensive treatise on soils in that state. It is profusely illustrated, showing soil conditions in various parts of the state, and also contains diagrams and tables useful to the road builder. A brief report on the work of the board relating to the naming, marking and routing of highways, is also included.

COMMERCIAL ENGINEERING. Bulletin, 1919, No. 58 of the Bureau of Education of the Department of the Interior. Report of a conference on business training for engineers and engineering training for students of business held in Washington, D. C., June 23 and 24, 1919. Prepared by Glen Levin Swigett. Paper 6x9 in. 180 pages and covers. Government Printing Office, Washington, D. C.

The Committe on Commercial Engineering of the Bureau of Education held a public conference with delegates from engineering schools, enginering societies, commercial organizations and interested Government bureaus The major topic on Monday morning, June 23, was business training for the engineer. In the afternoon of the same day engineering training for commercial enterprises was considered. At the morning session on June 24, the significance of war experience for engineering education was discussed and in the afternoon the major topic was training of the engineer for overseas engineering projects. Besides the report of the proceedings are lists of delegates present, engineering schools in this country and courses of study in various technical schools.

MEETINGS

Calendar of Coming Meetings

Apr. 12-17—United States Good Roads Association—Eighth Annual Convention, Hot Springs, Ark. Director General, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

Apr. 16-17—Bankhead National Highway Association—Fourth Annual Convention, Hot Springs, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

PERSONAL MENTION

Wm. J. Hunt has resigned as superintendent of highways of Bolivar, N. Y.

L. D. Appleby has succeeded Wm. J. Hunt as superintendent of highways of Bolivar, N. Y.

F. C. Frear was recently appointed county engineer of Douglas County, Oregon, with offices at Roseburg.

Eugene I. Cranch, formerly City Engineer of Port Arthur, Texas, has been appointed assistant engineer of the Kansas State Board of Health.

H. D. Bruning has resigned as chief engineer of the Ohio State Highway Department to enter the employ of the Ohio Paving Brick Manufacturers' Association.

L. P. Scott has been appointed a division engineer of the Kansas State Highway Commission, with headquarters at Fort Scott. Mr. Scott was formerly stationed at Salina.

Albert W. Dilling, formerly Assistant Engineer with the Universal Portland Cement Co., is now engineering assistant to D. R. Francis, Commissioner of Public Works, Chicago, Ill.

Col. M. L. Ireland, of the Motor Transport Corps, was recently appointed a member of the National Research Council's Committee on Economic Theory of Highway Improvement.

Wm. T. Huber, formerly with the Portland Cement Association and stationed in western New York, is now general manager of the Green & Lanctot Housewrecking Co., of Buffalo, N. Y.

ooo

The Illinois State Board of Tax Commissioners have approved of the following bond issues: Morgan County Jackson Township, Roberts Road, $17,500; Martin County, Center Township, Shoals and Jasper Road, $8,600; Clinton County, Jackson Township, Sims Road, $9,440; Hancock County, Vernon Township, Lane Road, $6,900; Benton County, Center Township, road fund, $2,500; Hendricks County, Marion Township, Hunt Road, $27,000; Whitley County, Richland Township, Grover and Schuman Road, $94,236.

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GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

WITH WHICH IS INCORPORATED

THE HIGHWAY CONTRACTOR AND ROAD BUILDER

Old Series, Vol. LVIII
New Series, Vol. XVIV

NEW YORK, MARCH 31, 1920

Number
13

Cooperation between Engineers and Contractors in the Execution of Highway Programs*

By R. G. COLLINS

Representative, Associated General Contractors

It is public knowledge that the biggest program of construction work in the country today is the highway program; that there are thousands of miles of highways to be built; that the reason for this big program is the need of better means of highway transportation, and that the states and the peoples of the states that have a satisfactory system of hard roads are becoming more prosperous every day.

The country is just waking up to the need of hard roads. The successful carrying out of this hard roads program is of vital interest to every citizen of the United States. Hard roads mean prosperity in the community in which they are built, cheaper transportation of farm and other products and a lowered cost of living.

The only way in which this hard road program can be satisfactorily carried out is by the working together of the engineer, who represents the state as to plans, specifications and design, and the contractor, who represents the state in the furnishing of the labor, materials and constructive ability, both working hand in hand for the good of the state and the completion of a satisfactory highway. In our opinion, this condition is best represented by the example of a team of horses. If both horses of the team are pulling in the same direction, at the same time and in the same way, a certain pull is exerted and a certain amount of work is done. On the other hand, if one horse starts and the other horse stands still, or if they pull in opposite directions, then there is bound to be reduced return from their efforts. So, in the same way, if the contractor is inefficient or inexperienced, or in any other way incompetent, or if the engineer is incompetent, technical, or narrow, or if in responsible charge of work there is placed the young college man who perhaps has not graduated or who has just graduated and perhaps is puffed up with his knowledge and importance, but without practical experience, then the work suffers.

The idea we wish to convey is that there are great responsibilities on both sides. The contractor, if he is competent, has spent a good deal of time and thought in preparing his bid for the work on the basis of a reasonable interpretation of the plans and specifications presented by the state.

Before submitting his bid, he has his representatives make a careful investigation of the site of the work, source and supply of materials, delivery, side tracks at stations, etc. He has the plans thoroughly figured and checked, and he is under the expense of preparing an estimate of the work. This expense often amounts to considerable. He then has to put up a certified check to accompany his bid, which check is often held at loss of interest on the money for a long time—sometimes longer than there is apparent need for.

We think that cooperation between engineers and contractors should start with the call for bids on the particular piece of road to be let. We do not think engineers should arbitrarily throw into the discard bids from responsible contractors who employ competent men to submit figures which, if the contractor be allowed to explain them, generally will show only a reasonable charge for the work. The state's estimate of the cost should be prepared in the same manner as the contractor's estimate of the cost, and both should be given consideration before the work is let or before the contractor's bid is rejected.

We know of examples where men went to war in 1917, returned to their jobs in 1919, and made up their estimates for their 1919 program of work from notes they had taken before they left, disregarding absolutely the increased cost of everything pertaining to the work which had arisen while they were gone; and the only argument which the state engineers could produce in discarding several bids from responsible contractors, familiar with local conditions, was the argument that their bids over-ran the engineer's estimate.

We believe that engineers should educate themselves in making up their estimates more on the costs which are not visible out on the job, but which nevertheless the experienced contractor has learned from bitter experience to include in his estimates. We heard, for example, at a recent convention, various engineers and contractors attempting to give off-hand the cost of unloading materials. One cost announced as being the total cost of unloading materials would just about pay for the plant depreciation, the average cost of the side tracks, and the setting up of the plant, which are, of course, fixed charges on any unloading plant. This left, of course, the actual work of unloading materials, the labor, demurrage, etc., which, of course, is a big item. Each job has its own conditions, and conditions vary in different localities so much that any engineer or contractor who would attempt to give a general unloading cost might be right in one place and very wrong in another. Each job must be figured by itself.

We think that where a prepared fixed estimate is to be the only guide in letting a contract, and where the highway engineers intend to reject without checking with contractors' bids that over-run the estimate, the maximum figure the state will pay should be public information before the letting, just as the contractor's bid is public information after it has been publicly read.

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*Paper presented at the 17th annual convention of the American Road Builders' Association Louisville, Ky., Feb. 9-13, 1920.

After the contractor has been awarded the contract, he has to have a large investment in plant; he also has an investment in his organization; and he must spend a season or longer in the construction of his highway contract.

In some respects highway construction is one of the most hazardous forms of contracting. The successful prosecution of the work is dependent on many conditions which must coordinate. First, there must be a constant, continuous flow of materials at a certain rate from the point of manufacturing origin to the railroad station. This flow of materials is an uncertain flow, as the contractor is apt to be either swamped with or out of material, due to the possibility of break downs at the material plants, shortage of railroad cars, or equipment, shortage of base materials, strikes, lockouts, and other circumstances over which the contractor can have no control. This mater of delivery of materials to the railroad station may prove to be a serious matter for the contractor. After the materials are delivered at the railroad station, if satisfactory switching service is maintained by the railroad, the contractor then has the problem of unloading and storing his materials.

The next link in the chain of operations is the delivery of the materials from the railroad station to the mixer at the site of the work. He is then at the mercy of the weather, break downs of his trucks or industrial plant, road conditions, and the labor supply of the men connected with the hauling of materials.

After the materials are delivered at the mixer, he is confronted with break downs of the complicated paving mixer, which is now on the market and which has so many points that may go wrong just at the time when he is preparing to make a showing. His showing is also dependent upon a satisfactory and sufficient labor supply. There is perhaps no branch of contracting which is so dependent upon the crew as highway work is dependent upon the crew at the mixer.

Another uncertain feature is the water supply. The pump or water system may fail at an inopportune time. The water supply may give entirely out, and the wells which he has drilled and which seemed to have an ample supply of water suddenly fail.

Each one of the operations named must coordinate in every respect.

If, on top of the difficulties, which may be called the contractual difficulties, and which at times tax the patience and skill of the most experienced contractor, he has to meet the difficulty of the inexperienced young engineer, who means well, and who, after having had a few years' experience, will make the best kind of an engineer, or has to work under the narrow, technical engineer who can see nothing but the printed specifications regardless of the conditions which may arise in different localities, and material conditions, he surely has a hard time of it.

The contractor can overcome some of the natural difficulties by his skill and experience, but the inexperienced engineer who tries to interfere with the operation of the contractor's plant, or who wants to tell him how to do his work when he doesn't know himself, or who takes an arbitrary stand simply because he has the power, can be a serious problem which will cause the most experienced contractor to lose money, and what is more serious to the state, lose progress.

On the other hand, the engineer of experience, who is ready with helpful advice at the time when it is needed, and who will interpret the specifications in the light of fairness and reason, and who is anxious for the work to progress, and who realizes that what the state wants is a first-class road, built in the shortest possible time by practical methods, is of great value to the client of both the contractor and the engineer, the people of the state.

This, it seems to us, is what is meant by cooperation between the contractor and the engineer. On the one hand, the engineer is fair and reasonable and helpful in every way that he can be, and the contractor meets the engineer half way, is ready to adopt suggestions that will further the work. In other words, they pull together and get the job done.

The problems of the contractor this past year have been very great. The shopmen's strike, coal strike, shortage of open top cars, embargoes, shortage of labor in some places, and inefficiency of labor everywhere, have tended to make highway work rather unattractive to contractors who may desire to get other work rather than highway work, and who waited through last season to see how their fellow contractors came out on their work.

It is the desire, however, of the responsible contractors, who put in the past year or two in the highway work, that the highway program shall be a success, and those responsible contractors are willing to cooperate in every way with the engineer and people of the state to make it a success. They feel that they are entitled to a reasonable profit for their work, and, in their opinion, it is the desire of most of the engineers that they shall have a reasonable profit, for it is evident that no legitimate business can long exist without a reasonable profit.

The highway program cannot satisfactorily be carried on without the aid of the better class of contractors. The idea that states can embark on a program of this magnitude by securing plant and organization and doing the work themselves, we believe to be erroneous. We feel that contracting is a profession, or business, just as manufacturing of lumber or shoes is a business, and that the state would be just as successful in embarking in the manufacturing of clothing, in the raising of food for its citizens, or the manufacture of lumber, as it would be in entering the field of construction of highways on a large scale.

It is a well known fact in contracting that the personality of the architect or engineer, or an organization, has a definite value in the price of a contractor's bid. Each harsh or unreasonable or unnecessary requirement in the specifications will be reflected in the prices paid for the work. On the other hand, the state which gets the reputation of interpreting its specifications reasonably, treating the contractor fairly, and showing an honest desire to help the contractor in his troubles and to help him make a profit will have this reflection in lower prices for their work.

We think that one way in which the engineer can help the road program is by scrutinizing more carefully the contractors to whom they let work. Every contract which is let to a contractor who is either not financially equipped or who lacks experience to do the work gives a black eye to the highway program. Every contractor who sustains a serious loss, goes broke, or fails to finish his work, or whose work is finished by his bondsmen, is taken as evidence that the highway game is a bad game for the contractor to get into. This is evidenced by the fact that the bonding companies are scrutinizing more and more carefully the bids of highway contractors, and we believe it is of vital importance to every state to prevent in every way it can the

(Continued on page 174)

The Design and Construction of Different Types of Pavement*

Bituminous Concrete

By THEODORE S. OXHOLM
Chief Engineer, Borough of Richmond, New York City

In these days of vast expenditures for new roads and pavements the art of road building has advanced rapidly from the practice of the former overseer or commissioner of highways of a few years ago to the standard methods now employed by civil engineers, many of whom have had the privilege of taking the special courses in highway engineering now offered by several of our leading colleges and universities. It is becoming increasingly difficult, therefore, to devise methods of construction which have merit and yet are not generally known to the profession.

Last spring the author, at the invitation of A. Swan, Jr., C. E., City Engineer of Trenton, N. J., made an inspection of sheet asphalt pavements in that city, which were laid directly on the concrete foundation without a binder course. Mr. Swan explained that by the use of a special corrugated tamper designed by himself he had corrugated the concrete base so deeply and uniformly at right angles to the traffic that there had been no creeping of the asphalt wearing surface under heavy use for more than two or more years, and a considerable saving in cost had resulted by leaving out the binder course.

In the Borough of Richmond, the author has been using for some years concrete for pavement base composed of trap screenings instead of broken stone and sand, mixed 6 of screenings to 1 of cement. It was determined in a certain contract to use Mr. Swan's tamper. After about 300 ft. had been tamped the assistant engineer, inspector and foreman on the work devised a roller made of a 2½-ft. section of a telegraph pole, with bands of 1-in. round iron fastened around the roller and spaced 4 in. on centers. A long pole attached so that the roller could move easily completed the outfit. The water was squeezed out of the concrete by a light roller, as used for concrete pavement, and then, as the concrete was beginning to set, the corrugated roller above described was rolled across the base once for each section. The result was most gratifying, as a perfect series of depressions appeared, 1 in. deep and 4 in. apart, uniform in character and extending the whole width of the base. It will readily be seen that this "washboard" surface will receive the asphalt or bituminous concrete and lock it so firmly to the base that creeping from lack of proper contact is prevented. It is thought that much of the creeping and rippling of the surface of bituminous concrete is due to lack of proper contact with the base.

Proper Methods of Construction Which Because of their Neglect Need Emphasis

Very often an old macadam road 5 or 6 in. in depth makes a suitable base for a bituminous surface, provided drainage conditions are, or can be made, good. Care must be taken, however, in preparing the old surface to make it as rough as possible so as to prevent the creeping of the new surface. The bond of the old pavement must not be broken, for if it is, its value is largely destroyed. Almost all old macadam roads are now surfaced with road oil which presents a smooth surface in patches. The best method of removing this oil surface appears to be the old-fashioned one of picking lightly by hand so as not to disturb the bond of the heavier stone. Some roads of this type which have been built by the author are very inexpensive and are giving good service. They are edged with old stone paving blocks, set in sand before the bituminous wearing surface is applied.

The subject of drainage is an important one to the road builder. It is generally overdone, resulting in useless cost, or underdone, resulting in great damage to the pavement. It is not difficult for the engineer to tell with approximate accuracy where drainage probably will be necessary and make his preliminary estimates accordingly. Springs and wet places may be noted and where changes of grades make additional cuts he should be prepared to underdrain when the work is under way and trouble is developed. The old style of stone drains, while efficient for a time, usually fill up in a few years and damage is sure to follow. The author uses 6-in. vitrified pipe with open covered joints in all French drains, which, with suitable outlets, will give good service for many years.

One of the most important pieces of road work in the Borough of Richmond that has been completed during the last few years is the paving of the Amboy Road, 9 mi. in length, running through the center of Staten Island and forming part of the main traveled route between New York and Philadelphia, Baltimore and Washington; also New Jersey coast resorts. Three years ago work was commenced on a contract for improving this road with a bituminous concrete wearing surface 2 in. thick on a 6-in. concrete base. The specifications called for the use of Bermudez asphalt, as the traffic was very heavy. The pavement was laid 20 ft. wide and concrete edging 6 in. in width was built up monolithic with the base. Four-foot earth wings were graded down to a uniform ditch along the sides except where passing through built-up sections where curbs and gutters already existed. The total cost of the work was $330,000, at pre-war prices, and after two years of service the appearance of this pavement is excellent and practically no repairs have been made. On the first section of about 3 mi. it was noticed during the suspension of the work for the winter that some transverse cracks had appeared. It was, therefore, decided to cut ¼-in. joints across the pavement, as it was being laid, 300 ft. apart, and to fill with asphaltic cement. On the balance of the work this was done and no more cracks have appeared.

As the bituminous material for the wearing surface is brought on the street it is dumped into the base and shoveled into place for the rakers. The shovelers tread down the hot mixture so that it becomes compressed before the roller reaches it. This causes an uenven density in the completed work and tends to make the pavement uneven. One method of avoiding this is to have the entire amount of each load of hot mix shoveled and spread in adjoining locations. This causes the breaking up of the portion treaded down and the rakers soon reduce the heavier portions to a uniform surface ready for rolling. Proper protection to the edges of bituminous pavements should always be provided, but often is not. If old paving blocks are not

(Continued on page 174)

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*Paper presented at the 17th Annual convention of the American Road Builders' Association, Louisvlle, Ky., Feb. 9-13, 1920.

The Illinois Highway Problem for 1920

Will Postpone Use of $60,000,000 Issue Hoping for Lower Construction Costs and More Favorable Discount in Bond Market

The present high price level of road construction has caused Illinois to abandon its 1920 program, according to an announcement by the Division of Highways of the Illinois Department of Public Works. Governor Lowden has figured prominently in the opposition to the construction of roads at greatly increased cost over last year, when road construction costs in the state averaged $32,000 per mile.

Bids on road work early this year averaged $42,000 per mile and bids opened on Feb. 25 averaged close to $50,000 per mile. Even at these increased prices contractors did not bid freely and in several lettings but one bidder appeared. In view of these facts, it is announced, road construction will be postponed and the $60,000,000 for which bonds were authorized by the people will not be drawn upon. All bids received will be rejected, except those for 29 mi. on the Dixie Highway and 9.5 mi. on the Chicago-Springfield Road.

The condition of the bond market was also given as a reason for this action. At the present time a discount of 6% or more must be borne by the state if the bond issue is sold. This amounts to about $2,500 per mile and when added to the cost of the cement used in construction, which is supplied to the contractor by the state and not included in the bids, increases greatly the cost per mile.

Burning Pavement Destroys Bridge

Iron Bridge Over Hudson River Between Troy and Cohoes, New York, Wrecked by the Burning of the Wood Block Pavement

Three of the five spans of the bridge connecting the cities of Troy and Cohoes, N. Y., were destroyed on March 4 by the burning of the wooden pavement of the bridge and one of the remaining spans was partly destroyed. The bridge was a wrought iron structure and was about 50 years old. It consisted of four fixed spans and a draw-span at the Troy end. Three of the spans were 175 ft. long, each, the spans at the easterly and westerly ends being 128 and 158 ft., respectively. Last year extensive repairs were made on the bridge at a cost of about $70,000 and the loss is estimated at about $500,000.

TWO OF THE WRECKED SPANS OF THE BRIDGE OVER THE HUDSON BETWEEN TROY AND COHOES, N. Y.

The fire is believed to have been started by a short circuit of the street car current and persons who witnessed the progress of the fire state that the flames spread over the entire length of the structure in a very short time. The pavement consisted of creosoted wood blocks laid on 3-in. flooring. It was put down two years ago at a cost of about $50,000. So rapidly did the fire advance that in less than half an hour after the conflagration set in the two middle spans had collapsed and crashed through the ice which covered the river, as seen by the accompanying illustration which shows the ends of two of the three completely wrecked spans. The efforts of firemen from both Troy and Cohoes were unavailing and the streams of water played upon the burning structure seemed to add to the vigor of the flames which fed upon the oil-soaked floor.

For an International Road Congress in the United States

The Executive Committee of the American Association of State Highway Officials Recommends that the United States Join the Permanent International Association of Road Congresses—Wants Meeting Here

That the United States accept the invitation of foreign countries to join the Permanent International Association of Road Congresses has been recommended to the Secretary of Agriculture by the executive committee of the American Association of State Highway Officials. The recommendation was made at a reecnt conference at Washington between the association and the Department of Agriculture.

Chief Thomas H. MacDonald, of the U. S. Bureau of Public Roads, who is also a member of the executive committee of the American Association of State Highway Officials, said that the United States was the only civilized nation not now a member of the international organization, and pointed out many advantages of membership.

No meetings of the Permanent International Association of Road Congresses have been held since before the World War. The last meeting was held at London in 1913. The next was to have been at Munich in 1916.

The American Association of State Highway Officials, through tis executive committee, also recommended that the international organization be invited to meet in this country next year.

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The West Virginia State Road Commission has approved plans for road bond issues of $1,000,000 each in Berkeley and Taylor Counties.

"The Women's Club" of York, Pa., will plant 2,500 trees along the Lincoln Highway in York County. The trees will be red oaks, American elms, supar maples and tulips, and will be spread over a distance of 25 mi.

Madison County, Illinois, has a road program for 1920 which will involve the construction of between 60 and 70 mi. of hard-surfaced roads, and about 40 new bridges, according to a recent statement by W. E. Howden, County Superintendent of Highways. Practically all of the work is on contracts which were awarded last summer and fall, and on which work was started last year.

The Pennsylvania State Highway Department has called attention to the fact that under the motor vehicle laws of Pennsylvania it is illegal for Pennsylvania motor car dealers to drive fleets of cars over the roads of the state unless each machine bears a dealer's license tag. It is not legal to drive through Pennsylvania motor vehicles bearing only markers carrying the words "In Transit." Dealers' licenses cost $10 each and these must be obtained in cases such as referred to. The only exception is in the case of cars from other states where the use of the "In Transit" marker is allowed, and with which states Pennsylvania has agreements.

GOOD ROADS

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Copy for classified and other advertisements where proofs are not required will be accepted until noon on Monday of the week of issue.

Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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COOPERATION IN THE CONSTRUCTION OF HIGHWAYS

More cooperation by engineers and contractors engaged in the construction of highways has always been one of the great needs in that work. At some time, probably as far back as the formative period of the rest of the prejudices and tendencies and mental slants that comprise what is called "human nature," the engineer and the contractor acquired the idea that they were natural enemies. And many of them have never succeeded in disabusing themselves of that notion.

Of late, however, there has been evident a sincere desire on the part of road builders—using that term to denote both engineers and contractors—to work together. The subject of cooperation has been thoroughly discussed at road conventions and in the technical press, and there have been brought forth many suggestions for promoting better relations between the engineer and the contractor on road work. Most of these ideas are valuable, but some of them can hardly be carried out immediately or even in the very near future, for not a little of the lack of cooperation by engineers and contractors is due to practices that have obtained so long that it will take time to change them.

On the whole, however, the outlook is promising and the changed aspect of the problem is without doubt largely due to the different type of contractors engaging in highway work. Men of more thorough training, greater skill and longer experience, and with greater financial resources are entering the field as contractors. On the other hand, highway engineers are gaining in experience and in the ability to see the job from the viewpoint of the contractor.

SAFE AS WELL AS SERVICEABLE ROADS

Within a few weeks the country roads will again be crowded with automobiles and the Monday morning papers will begin to carry stories of accidents emphasizing the necessity for building safety into new roads and doing what is possible to make existing roads less dangerous.

Before the automobile became the predominating factor in highway traffic, safety was a minor consideration. Sharp turns, steep grades, inadequately protected embankments and weak bridges were sources of comparatively little danger to occupants of horse-drawn vehicles, to bicyclists or to pedestrians. Little effort, therefore, was made to flatten the sharp curves and superelevation was unheard of in highway practice. Some attempts were made to cut down steep grades, but not much progress was made. Light guard rails were erected in the particularly dangerous places, and the bridges built were light almost to the point of flimsiness, according to present standards.

Nowadays the traffic conditions are altogether different. The horse-drawn pleasure vehicle has been almost entirely replaced by the automobile. To a lesser extent, but at the same time to an extent not thought possible a few years ago, the motor truck has superseded the heavy teams and the lighter ones that formerly did all of the hauling by highway. And the total volume of traffic, both pleasure and business, has increased enormously. The change from horse-drawn to motor-driven vehicles has also brought heavier loads and greatly increased speeds, and all of these factors have made dangerous many highways that were formerly safe.

That safety must now be considered in the design of roads is obvious, and it can not be too strongly emphasized. The road builder of today must flatten and bank his curves, keep his grades down to the minimum, provide sturdy guard rails and see to it that his bridges are at least equal to the rest of the road in power to sustain loads.

One of the most important matters in the design of roads for modern taffic is the alignment. In order to drive a motor car in reasonable safety, the driver must be able to see the road for a considerable distance ahead; that is, the sight-line must be long enough to permit the driver to turn out in safety or to bring his car to a full stop if necessary. Formerly, a sight-line of 100 ft. or less was not uncommon on country roads. And there are still many such roads. That distance is more than sufficient for horse-drawn traffic, but quite inadequate for motor traffic. A speed of 25 mi. an hour is not excessive on a properly designed and constructed road, but two cars driven at that speed around a turn having a sight-line of only 100 ft. would be visible from each other for less than two seconds before meeting.

It is possible to lengthen the sight-line on almost any road without incurring undue expense. Bushes and other obstructions on the inside of a curve can be removed and it will often pay to take out a considerable amount of earth or even rock where there is a bank on the inside of the curve.

Another hazard that is increased under modern traffic conditions is that of the railroad grade crossing. The only sure means of avoiding accidents at these places is the separation of the grades. That, however, has to wait until funds are available, because of the great cost usually involved. Until an under or over crossing can be built, however, there are many ways by which the danger can be reduced to a minimum.

Safety is one of the prime requisites of modern highway construction and reconstruction and no design that fails to provide every possible safeguard can be considered good.

New York's Road Maintenance and Repair Appropriation

Governor Signs Bill Appropriating Only Half of the Amount Asked by Highway Commissioner

Governor Smith of New York signed the Sage-Machold bill appropriating $7,500,000 for the maintenance and repair of highways during the coming year on March 24.

A memorandum by the Governor accompanying the bill called the attention to the fact that State Highway Commissioner Greene requested in appropriation of $15,000,000 for maintenance and repair and that the Governor had included that amount in the budget submitted by him to the Legislature.

"The Highway Commissioner pointed out that $15,000,000 would be necessary to keep up with our highway deterioration and to svae the state's large investment in roads needing reconstruction," the Governor stated. "He pointed out that from 1912 to 1917, inclusive, the state reconstructed an average of 212 mi. a year; that in 1920, due to the reduced maintenance appropriation and the increased costs, he will be unable to reconstruct more than 125 mi.; and that by reason of the cut in this appropriation he will be forced to cut in half the maintenance work contemplated in each county."

Cooperation Between Engineers and Contractors in the Execution of Highway Programs

(Continued from page 170)

loss or failure of contractors on its work. With this in mind, we believe that the qualifications of contractors should be examined very carefully before awarding work and that, after the award of work in a certain locality to a contractor, the state should protect this contractor in a measure by not awarding in the same locality more work than the material men in that locality can supply with material.

We think that engineers can help the contractor by putting the payment of road contracts on a fairer basis, by paying for completed work when completed. On some jobs this year there are long stretches of road where the pavement and the structures have been completed. On these stretches of road the contractor has been forced to carry the expense of a partially paid estimate through the winter season when only a small amount of work, in most cases on the shoulders, is necessary to be done to entirely complete the section of work according to the contract. If the estimate were held out on the shoulders, it would be ample in most cases to more than pay for the completion of this work and, besides, the contractor is forced to carry a bond for the completion of these shoulders. The roads we referred to have been open to the public. It is impossible for the contractor without police powers to keep the public off these roads unless the engineers furnish the police power. We claim that where a road is open for use the responsibility for that road is upon the state. The payments for work done on it should be made in full.

We think that another way which engineers can greatly help the contractor is for the state to try to make general arrangements with the railroads for furnishing side tracks of sufficient length and accessibility to allow the contractor to unload, store, and handle to the work his materials from them without asking the contractor to carry the gamble of this cost, which varies considerably. Also, we think the state officials can greatly help by attempting to secure from railroads preferential distribution of cars and preferential demurrage rules, as under the present classification, in which road materials are on the non-essential basis, they are the first commodities, the movements of which are hit by embargoes, heavy traffic, etc.

We also think that highway work will be made more attractive to contractors by the prompt and liberal payment of estimates.

We do not think that engineers always realize the amount of money the contractor has to carry invested in his plant and his overhead. And by "overhead" we mean cost of all kinds of insurance, bonds, camp losses, railroad fares and other costs necessary in the securing of labor, a fair carrying charge for expenditure on the work, traveling expenses, and the general plant cost, which is always large.

In conclusion, we believe that engineers are awakening to the fact that responsible contractors' organizations nowadays are generally headed by engineers, trained in engineering and construction problems; that these organizations are also headed by respected business men whose aim is to run their business on ethical business lines We also believe that the engineer, for his good, our good, and the good of the work, is coming more and more to realize that even as we need him, also does he need us. Let us hope for more team work between us, more mutual understanding and more confidence in each other. In no small measure does the highway program in this country depend on the fulfillment of these hopes.

Bituminous Concrete

(Continued from page 171)

available either concrete edging or a steel angle iron of proper design and anchored into the concrete base will protect the pavement from undue wear. The failure to provide this protection will soon result in an 18-ft. road being reduced to 16 ft. in width and the narrower it gets the more rapidly the pavement deteriorates.

Bad Practices Which Should be Eliminated

The placing of a bituminous concrete wearing surface upon the top of an old penetration macadam road as a base is sure to result in serious damage to the pavement. Wherever an excess of road asphalt exists in the original pavement it will soften the new wearing surface over it and disintegrate it within a year.

While a liberal use of the oil burner in preparing the foundation will improve this condition considerably, yet in the author's opinion this form of old pavement provides a very poor base for a hot mix wearing surface.

Where an old water-bound macadam pavement has been covered with 3 or 4 in. of penetration macadam and it is desired to place a new wearing surface of bituminous concrete, the author has had good results from removing the penetration pavement entirely and forming a new crown and repairs to the old macdam with new ¾-in. stone and screenings.

One of the most important defects in bituminous pavements, and one which is undoubtedly caused by the great loads being carried by enormous trucks, is the pushing forward of the top of the wearing surface, creating waves and ripples that sometimes are so marked that the bituminous material has to be removed and replaced. In the opinion of the author, this is caused by requiring a too high penetration test in the asphaltic cement. This has usually been placed at from 50 to 70 in cities near New York, but latterly the Borough of Manhattan has gone to the other extreme and laid pavements at penetration of 30. While the author believes that cracks in bituminous surfaces are preferable to ripples, and can be more economically repaired, yet a medium hardness should be called for, and

(Concluded on page 178)

EQUIPMENT—TRADE—MATERIALS

"Never Failing Water"

The above caption is the title of a booklet on pumps and pumping, recently issued by the T. L. Smith Co., of Milwaukee, Wis. It contains illustrated descriptions of the units of the Smith line of force, diaphragm and centrifugal pumps of various sizes, and data on the use of pumps in connection with paving mcahinery.

It contains definitions of some of the expressions used in pumping and contains information showing how to figure the size of a pump necessary to bring a given amount of water from any specified distance, and also a number of tables on the operation of pumps and the piping of water. These tables include one on the friction of water in wrought and cast iron pipes, one showing the number of U. S. gallons in rectangular tanks and another showing the number of gallons in round cisterns and tanks.

The booklet is 7½x10½ in. in size, and consists of 16 pages and covers. It is printed in red and black, with heavy covers printed in colors.

New Universal Shovel

The Bucyrus Co., South Milwaukee, Wis., has recently issued bulletin No. C-301 which announces a new revolving shovel, known as 30-B, which supersedes their 18-B revolving shovel.

The machine is so designed that with very few additional parts, it may be used as a revolving shovel, a sewer shovel, a high-lift revolving shovel, a dragline excavator, a clamshell excavator or a crane. It is maintained by the manufacturer that because of the design of this machine the universal feature has not sacrificed the power in any way nor has it limited any of the functions of a machine designed for any of the above mentioned purposes.

The truck frame is so designed that it will accommodate caterpillar traction, traction wheels or a railroad truck. As a revolving shovel it carries a 1-yd. dipper. As a clamshell excavator the machine will carry a 1-yd. clamshell bucket with a 35-ft. boom or a ¾-yd. bucket with a 40-ft. boom. When used as a crane it has a capacity of 9¾ tons at 20 ft., when mounted on caterpillars, and 9 tons in the same radius on trucks or traction wheels. The 30-B dragline supersedes the Class 7 Bucyrus dragline excavator and carries a 1-yd. bucket on a 35-ft. boom or a ¾-yd. bucket on a 40-ft. boom. To convert the machine into a sewer excavator, two combinations of dipper handles are offered. With a 30-ft. handle it will dig a trench 20 ft. deep and with a 24-ft. handle a trench 14 ft. deep. For high lifts for special work a 26-ft. boom and 17-ft. handle may be purchased.

NEW "30-B" BUCYRUS SHOVEL

The caterpillar mounting of the 30-B has no complicated side frames and the use of chains in the driving mechanism has been completely eliminated, with the motive force supplied through direct gearing. The treads are of cast steel, with a large smooth bearing surface, enabling the machine to travel over city streets, pavements and finished roads without danger of damaging the surface. The elimination of the caterpillar frame adds not only to the simplicity and strength, but also permits easy access to the rollers, links and tumblers for purposes of inspection and maintenance.

Southern Contractor Uses Tractor

An example of the growing use of road machinery, and especially of mechanical methods of hauling road machines, is reported by the Lauson Mfg. Co., of New Holstein, Wis., tractor manufacturers.

The instance cited is the use of a Lauson tractor by the Hornaday Construction Co., of Memphis, Tenn. According to a letter from that company, it is using a tractor for exceedingly heavy road construction work. The tractor is used for hauling Maney four-wheeled excavators. "These wheelers, are in loading," the company reports, "forced into reasonably hard street earth, and are filled to full capacity of 1 cu. yd., using the tractor in place of a four-up team. We were never able to hook up enough mules to load them properly."

LAUSON TRACTOR HAULING GRADER

The accompanying illustration shows a tractor helping out a pair of mules with one of the excavators.

T. L. Smith Company Opens Eastern Offices

Offices and warehouse have been established in New York City by the T. L. Smith Co., of Chicago, Ill., so as to render more efficient service to purchasers of construction equipment in the eastern district. The offices are in the Hudson Terminal Building on the ground floor and the warehouse is situated on Lilly St., in Newark, N. J.

E. R. Marker, who has been placed in charge of this office, is well known in the East, having been connected with the company for seven years. For four years he was in charge of the Milwaukee office and for the past three years has been sales manager, operating through the Milwaukee office.

In order to follow up prospects for Rex mixers and pavers, the Chain Belt Co., of Milwaukee, Wis., is sending out, through its representatives at various points, a series of bulletins describing performances of the company's mixers. The bulletins are gotten up in a form similar to that of the company's advertisements with a strand of chain—indicative of the type of mixer—running down the right hand side of the page, and an illustration of the particular machine that forms the subject of the bulletin, across the top. Each bulletin tells the story of some actual performance of one of the company's machines. These are sent out at regular intervals to prospects and cover the line of Rex paving mixers and also the Rex building mixers.

A new catalog of the Smith Simplex paving mixers has recently been issued by the T. L. Smith Co., of Chicago, Ill. It is designated as bulletin No. 409-A and is 7½x11 inches, with 20 pages and covers. Many interesting mechanical details are discussed and illustrated, and complete specifications are included of the 10-E, 14-E and 21-E mixers. There is also included a table of "Quantities and Proportions for Efficient Mix."

MEETINGS

Calendar of Coming Meetings

Apr. 12-17—United States Good Roads Association—Eighth Annual Convention, Hot Springs, Ark. Director General, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

Apr. 16-17—Bankhead National Highway Association—Fourth Annual Convention, Hot Springs, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

May 10-11—American Association of Engineers.—Annual meeting, St. Louis, Mo. Secretary, A. H. Krom, 63 E. Adams St., Chicago, Ill.

May 13-15—League of Texas Municipalities.—Eighth annual convention, Dallas, Texas. Secretary, Frank M. Stewart, University of Texas, Austin, Texas.

First South Carolina Road Institute

The First South Carolina Road Institute was held at the University of South Carolina, Columbia, on Wednesday and Thursday, March 3 and 4. The meeting was held under the auspices of the State Highway Department and the University, and speakers from various counties of South Carolina and from other states presented the various problems and needs as well as the best up-to-date practice of highway improvement.

Wednesday forenoon, March 3.

The first session was opened by Dr. W. S. Currell, President of the University of South Carolina, in a very interesting address. Dr. Currell tendered the facilities of the University to the visitors and expressed his pleasure at being the host to the First Road Institute. He emphasized the important relation of improved roads to good schools, church attendance in rural communities, and all other phases of social advancement. Bidding the institute Godspeed in its efforts to advance the work of highway improvement, Dr. Currell turned the meeting over to A. Mason Gibbes, President of the Gibbes Machinery Co., of Columbia, who presided during this session. Mr. Gibbs, in a few pointed sentences, expressed his pleasure at the opportunity to preside at the opening meeting of the institute and referred to the good roads campaign in Richland County during which he originated the slogan, "Good Roads, South Carolina's Greatest Need."

C. O. Hearon, Member of the State Highway Commission, then explained the purpose of the Institute, emphasizing the importance of getting together for the exchange of experience of the men who are to spend millions of dollars for the citizens of the state within the next few years. Mr. Hearon said, "when we have seen South Carolina and realize that the state has so many roads to build * * * * * it is very evident that we are going to have to work in South Carolina and the most important thing is for the people of the state to get together and know their resources and know how to care for the roads they are going to build." He then referred to the road bill now before the Legislature and to the responsibilities and difficulties of state maintenance. Speaking of the use of the automobile tax for maintenance, Mr. Hearon said, "The tax will have to be expended in the counties in which collected. And the ideal and the hope will be to concentrate the fund that will be paid in by the automobile owners of that county for the purpose of continual maintenance, so that the benefit is going to be pretty close to the people who contribute."

R. Goodwin Rhett, of Charleston, S. C., then spoke on "State and County Highways, Their Relations and Functions." Mr. Rhett compared the development of highway traffic and transportation to the growth of railroad transportation in the past. As the railways have advanced from the days of wooden rails to that of heavy steel rails on a well ballasted track, so must the highways have hard-surfaced pavements to meet the demands of the times, he said.

Prof. Stephen Taber, of the Department of Geology of the University, then presented an excellent paper on "Road Surfacing Materials in South Carolina." He brought out the fact that some sections of South Carolina have large quantities of trap rock which is one of the finest of road building materials though it has not yet been utilized to any great extent for road building in South Carolina. Prof. Taber also pointed out the need of a thorough investigation of the available road materials in the state at this time when there is such a demand for road construction.

D. R. Coker, of Darlington, a well known business man and farmer and the pioneer in the production of improved seeds in South Carolina, spoke on "The Obligation of Land Owners as Regards the Construction and Care of Roads." Mr. Coker forcefully presented the benefits accruing to the farmer from hard-surfaced roads. He spoke of the great possibilities in truck farming in South Carolina and showed that good roads are a necessity to the truck farmer. Truck growing, he said, could not be followed profitably at any great distance from an improved highway, owing to the expense of transportation and loss in quantity of truck hauled long trips over back roads. He also gave a striking example of the value of good roads to the farmer in marketing his cotton. In some markets of the state there is no difference made in price for ⅞-in. and 1-in. staple. Other markets make a difference of from 1 to 2 ct. per pound. In the case of 1⅛-in. staple there may be a difference in two markets of $35 per bale. If we had good roads the farmer could put his cotton on a truck and carry it to the market paying the highest price. One farmer carried a load of cotton from Lexington County to Hartsville, but is not likely to repeat the experiment with our present roads, according to Mr. Coker.

Wednesday afternoon, March 3.

The afternoon session was opened at 2:30, with S. B. McMaster, of Columbia, presiding. The discussions were devoted to the maintenance of roads.

D. H. Winslow, formerly Maintenance Engineer with the U. S. Bureau of Public Roads and now with the North Carolina Highway Commission, gave an instructive talk on "The Squad System of Road Maintenance." This was followed by a paper by Geo. C. Stanley, County Engineer of Cherokee County, on "Road Maintenance in Cherokee County." Mr. Stanley has been using the squad system, as discussed by Mr. Winslow, and has found it very satisfactory in maintaining the roads constructed by bond issue. There was a general discussion of these papers led by A. L. Ervin, Supervisor and Engineer of Florence County. The officials and engineers present showed keen interest in this method of maintenance.

Henry G. Shirley, Secretary of the Federal Highway Council and formerly State Highway Engineer of Maryland, next described in detail the method of maintenance by the patrol system. This method is used quite extensively on the roads of Maryland and has been very satisfactory. This system, according to Mr. Shirley, may be more expensive than the squad system, but the better condition of the roads at all times will justify the extra expense on heavily traveled roads. Mr. Shirley brought out the fact that the cost of maintenance is low or high only as the amount of traffic using the road. This cost is properly compared on the basis of the number of tons carried and the number of miles maintained. A cost of $1,000 per mile per year for maintenance on one road may be lower, on this basis, than $100 per mile per year on another.

Wednesday evening, March 3.

At 8:30 p. m., the Institute assembled at the University Chapel and saw a moving picture showing a modern road construction plant in operation in the building of a concrete road near Chicago. This was followed by some views furnished by the U. S. Bureau of Public Roads, illustrating proper methods of construction and drainage. The visitors then adjourned to Flynn Hall where they enjoyed a smoker and an excellent repast provided by the members of the University.

Thursday forenoon, March 4.

The Institute reassembled on Thursday morning, with Frank E. Broadnax, a prominent business man of Columbia, presiding. Mr. Broadnax made a few appropriate remarks on the great progress made by South Carolina in road improvement and the necessity of keeping the legislators informed as to the needs and desires of the people in the matter of road legislation.

P. F. Patton, County Engineer of Spartanburg County, then delivered an instructive address on "Top-Soil Roads." Mr. Patton presented very clearly many reasons why the counties should continue to build this type of road, and emphasized the importance of selecting competent men to handle this type of construction as well as the hard-surfaced roads. The discussion of this subject was continued by L. M. Weisiger, Resident Engineer of the State Highway Department, who described an experiment now being made in Spartanburg County in the construction of an asphaltic macadam surface on a well drained top-soil base.

Following this discussion, a paper on "Road Location" was read by R. T. Brown, Chief of Surveys, South Carolina State Highway Department. The points chiefly stressed in this paper were the importance of making the roads safe for modern traffic by providing good alignment and unobstructed view, and of so taking care of drainage during location that any kind of surface may be used later with assurance of the location being permanent.

A paper was presented by N. C. Hughes, County Engineer of Laurens County, on "Drainage Structures and Sub-Drainage." Mr. Hughes laid particular emphasis on the importance of making the waterways large enough. One feature of culvert construction that Mr. Hughes finds very serviceable is the construction of a catch basin at the inlet end of pipe culverts in connection with the headwall. This prevents stoppage of the culvert by debris and renders it easy for the maintenance force to keep the culvert in good working condition.

"Care of Road Equipment" was next ably discussed by H. H. Kester, County Engineer of Lancaster County. Mr. Kester was one of the first men in the state to use a motor truck for dragging roads. The great importance of securing suitable men to handle motor equipment was urged by Mr. Kester, who stated that he would pay, if necessary, $200 per month to secure a good mechanic to care for his equipment.

Thursday afternoon, March 4.

The program was continued at 2:30 with Mr. Broadnax again presiding.

F. H Murray, Chief of Construction, South Carolina State Highway Department, read an excellent paper on "Hard-surfaced Roads," giving in some detail the distinguishing features of the various types of hard-surfaced roads. Mr. Murray emphasized the necessity of rigid inspection during the construction of the higher type roads. An active interest and absolute honesty on the part of the inspectors are not only desirable but essential, according to Mr. Murray.

"The Relation of the Highway Engineer to Successful Road Location, Construction and Maintenance," was discussed by Professor T. F. Hickerson of the Civil Engineering Department of the University of North Carolina. [Prof. Hickerson's paper was printed in "Good Roads" for March 17. — Ed.] The discussion of this paper was led by Capt. J. Roy Pennell, State Highway Engineer of South Carolina. The point was made by Capt. Pennell that the matter of engineering rested on the question of dollars and cents. "An engineer is employed not because he is called an engineer," said Capt. Pennell, "but because he can secure more for a dollar."

The subject of "Culverts and Bridges," was presented in an excellent paper by J. W. Barnwell, Bridge Engineer of the State Highway Department. Mr. Barnwell's paper supplemented that by Mr. Hughes in that it dealt chiefly with the larger drainage structures. The necessity of securing sufficient waterway and gettnig well above high water with expensive bridges was urged by Mr. Barnwell. The various types of culverts and bridges were briefly discussed, and the need for greater width and carrying capacity in view of modern traffic was pointed out. From investigations made by Mr. Barnwell, he stated that the cost of reinforced concrete bridges compares very favorably with that of steel bridges with concrete floors, in some cases the concrete bridges being actually lower in first cost.

Following Mr. Barnwell's paper and a brief discussion thereof by Prof. Hickerson, the subject of sand-clay roads and their maintenance was taken up. Constant and systematic maintenance, it was agreed by all the speakers, is necessary on this type of road. It was also evident from the discussions that there is still a demand for the cheaper types of roads throughout the state, on lines where the traffic does not necessitate hard-surfaced roads.

So great was the interest in the institute that, on motion of Mr. Wilson G. Harvey, of Charleston, a committee was appointed and plans were made for a permanent organization, with provision for one meeting each year to be held alternately with the University, Clemson College and the Citadel. The attendance at the institute exceeded all expectations. There were 176 registered attendants, 64 of whom were county officials representing 32 counties of South Carolina. The largest number from any one county was 7, from Union County. There were 10 county engineers as well as a number of engineers from the State Highway Department. Three of the speakers were from without the state; two, Mr. Winslow and Prof. Hickerson, from North Carolina, and one, Mr. Shirley, from Washington, D. C.

PERSONAL MENTION

Clyde Fulton has been appointed city manager of Roswell, N. M.

F. A. Tokelson has resigned as city engineer of Marquette, Mich.

A. R. Hebenstreit has resigned as city manager of Albuquerque, N. M.

Ross J. Buck has been appointed city engineer of Muskegon, Mich.

F. L. Maloney has succeded L. H. Kidd as city manager of Knoxville, Tenn.

George Sperbeck has been appointed assistant city engineer of Alameda, Cal.

Edwin P. Dewey has succeeded R. V. Orbison as city engineer of Pasadena, Cal.

M. A. Turner, formerly City Manager of Ranger, Texas, is now in business in that city.

W. G. Caldwell was recently appointed highway engineer of Waukesha County, Wisconsin.

S. B. Davis of Quitman, Texas, has been appointed county engineer of Wood County, Texas.

John W. Ballew, formerly City Manager of Hickory, N. C., has engaged in business in that city.

A. R. Garnock has resigned as city engineer of Eau Claire, Wis., to enter the contracting business.

R. N. Kellogg, of Enterprise, Ore., was recently appointed highway engineer of Wallowa County, Oregon.

R. V. Orbison has resigned as city engineer of Pasadena, Cal., to become city engineer of South Pasadena.

W. H. Slinn, formerly Assistant City Engineer of Kingston, Ont., Canada, is now with E. G. M. Cape & Co., Ltd.

Wilbur Williams, formerly Borough Engineer of Meyersdale, Pa., has formed a partnership with J. T. Monahan of that city.

George Grupe, formerly superintendent of the water department of Cleburne, Texas, is now city manager of Brownsville, Texas.

J. T. Hurd hs resigned as city engineer of Chippewa Falls, Wis., and succeeds A. R. Garnock as city engineer of Eau Claire, Wis.

R. D. Keyes has been appointed engineer on the California State Highway Commission and detailed to duty in San Diego County.

H. J. Hemstreet has been transferred from the Portland, Ore., office to the Missoula, Mont., office of the U. S. Bureau of Public Roads.

George F. Turner was recently appointed city engineer of Youngstown, O. Mr. Turner was formerly county engineer of Mahoning County.

J. Clark Keith, formerly Assistant City Engineer of Moose Jaw, Sask., Canada, is now manager of the Windsor, Ont., office of Morris Knowles, Ltd.

H. Springer, formerly Municipal Engineer of St. Vital, Manitoba, Canada, has been appointed engineer in charge of road building for the municipality of Dauphin, Manitoba.

R. H. Pennartz has been appointed resident engineer on federal aid work in Shawnee County, Kansas. Mr. Pennartz was formerly on the engineering staff of the Kansas State Highway Commission.

OBITUARY

Felix R. Smith, formerly Assistant City Engineer of Nashville, Tenn., died at his home in that city at the age of 82, following an attack of influenza.

Charles W. Cook, Sales Manager and Assistant General Manager of the Acme Road Machinery Co., died in the hospital at Beaver Falls, Pa., on March 4, after a brief illness with influenza and pneumonia. Mr. Cook was born and spent a good part of his life in the Middle West, being engaged in business at various times in Fort Wayne, Ind., and Waupon, Wis. In 1915 he became sales manager of the Acme Road Machinery Co., and was on a business trip in the South and was stricken with the fatal illness when returning to his home in Frankfort, N. Y. He is survived by one sister and three nieces.

———OOO———

Bituminous Concrete

(Concluded from page 174)

he suggests 45 to 50 and has been laying considerable pavement at 48 during the past summer.

Bituminous pavements adjoining the rails of street car tracks should be protected from disintegration caused by vibration of the rails. In some cities this has been neglected.

It is impossible to properly compact the bituminous material under the head and flange of the rails. The vibration during the passage of cars destroys the bond of the bituminous material, allowing surface water to enter the space thus formed, resulting in the final disintegration of the pavement. This defect may be obviated by the use of stretcher courses of stone blocks along both sides of the rails. The width of the stretcher area should be sufficient to permit the ordinary rail repairs to be made without cutting into the bituminous pavement.

Another method of construction is to pave up to a steel angle iron laid parallel to and adjoining the rails, the pavement then being practically independent of the railroad tracks.

The proper way for an engineer to find out defects in his own practice is to visit periodically other localities. He will generally find some conditions better cared for than at home and sometimes may find that he has solved a certain problem better than his brother engineer.

GOOD ROADS

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NEW YORK, APRIL 7, 1920

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Road Location*

By R. T. BROWN†

It is worth while in studying road location to take a brief review of the factors that entered into the location of highways in the past. The first of these factors was no doubt, the easiest way through, the "line of least resistance."

In the days when settlements were few and far apart, labor scarce and machinery lacking entirely, the quickest way to open a line through was the one chosen. At first the roads were mere footpaths or bridle paths, which later developed into important highways.

Another important consideration in those days was that of local conveniences. Since communication would be chiefly between neighbors or nearby settlements, of course the roads wound around by each cabin and often considerably out of the way to pass by a mill situated at a convenient waterfall or a large cleared area where much hay and corn were produced. In some cases the trail even went a half mile out of the way to pass a good spring, just as it might do today to pass a good "still."

A little later, when the community was more thickly settled and fences became necessary, the roads became property lines or were relocated so as to follow property lines. When new roads were to be opened they often had to zigzag around half a dozen fields to the mile, hemmed in by the timber on one side and a rail fence on the other. We are still suffering from the effects of property lines on road location in many sections, even after the said property lines have ceased to exist.

When communication became more frequent and the condition of the roads of more importance, drainage became a factor in the location of roads. Since bridges were troublesome to build and culverts of hollow logs were used sparingly, the natural course was to follow the ridges. This method of location provided for the most part better drained roads than were secured by following the lines of least resistance, or property lines, but it frequently necessitated the use of steep grades getting to the top of the ridges. Roads located on routes of natural drainage often went long distances out of the way to avoid crossing a creek or river. Such location, however, was a long step in advance of the principles followed previously. And today, with all our modern methods, materials and machinery, we will do well to keep the idea of natural drainage in mind.

The next factor in the development of the science of road location was the increasing use of wheeled vehicles. Previously most of the travel had been on foot and on horseback with only an occasional cart or wagon. But as wagons became more numerous, easier grades were found desirable. Steep grades continued to exist, however, but there was great improvement, due to the influence of wheeled vehicles.

As traffic became heavier, the need for better kept road surfaces became more obvious. In order to avoid the formation of great gullies along the wheel tracks on steep grades it became necessary to relocate the road around the hill instead of over it. Thus the requirement of a better surface came to be a factor in the location.

As the use of steel bridges became more common, it became possible to avoid the long detours formerly necessary when a large stream was encountered. The road could then follow a more direct course and often serve communities previously cut off from it. But the road must get to the bridge site somehow—and if the bridge were constructed at some other place than an old ford a new stretch of road was necessary. Often the connection with a new bridge was made on a temporary location and was an awful example of "how not to do it." But occasionally the advantage of the hill was taken and good location was secured. Such an improvement made a lasting impression on the users of the road, and soon they began to relocate around other hills and to bridge other streams.

In the early development of the principles of road location, nearly all the factors tended to give crooked roads, with bad to fair grades, and of only sufficient width to enable two vehicles to pass by using the ditches. In many places these conditions still prevail to a considerable extent.

The conditions just described, however, are rapidly disappearing on the important highways of our state as well as throughout the country. While we have possibly been one of the most backward states in the matter of road building, we are at last recognizing the trend of the times and acting accordingly.

The effect of motor truck traffic has been to open our eyes to several needs, yes, even absolute necessities, in respect to our roads.

First, the coming of the automobile brought out the need of wider roads. We must be able to pass other vehicles without getting into the ditch. We must even be able to pass two other vehicles abreast on the main highway. We must also have a margin of safety in passing swiftly moving vehicles. These requirements mean wide roads.

Then we have found the need of better alignment. The shortest distance at which we are first able to see an approaching vehicle should not be less than 300 ft. Even with a sight distance of this length, two automobiles meeting at speeds of 25 mi. per hour have only about four seconds in which to turn out and pass. Since the tendency is strong for both drivers to take the inside of curves the actual sight distance allowed should be 600 ft. or more on the center line of the road. To secure such a view as this of the road ahead required long easy curves. When possible the curves should be so located that no buildings, high banks, or cliffs stand close to the inside to obstruct the view. Since such buildings may be erected after the road is built it is best to make the curve so flat that no building off the right of way con obstruct the view.

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*Paper presented at the First South Carolina Road Institute, University of South Carolina, Columbia, S. C., March 3-4, 1920.

†Chief of Surveys, South Carolina State Highway Department.

It is, of course, understood by road builders everywhere today that almost any feasible change of location should be made to eliminate railroad grade crossings. Counties can well afford to go to considerable expense to render an important highway free from these death traps. South Carolina certainly has its share of these, but it is very encouraging to see the great number that have been eliminated within the past two years. On one of the main highways in Laurens County 15 grade crossings have been eliminated by merely relocating the highway. The same thing is being done elsewhere, though possibly on a smaller scale. In cases where grade crossings are unavoidable even by the relocation of the road or by the construction of bridges or under-passes, great pains should be taken to secure a location for the crossing that will give an unobstructed view of the track in either direction. The crossing should be as nearly as possible at right angles to the railway, for the same reason. The State Highway Department has established a ruling that on grade crossings constructed under its supervision the road must make an angle of not less than 45 deg. with the railroad, both on account of the view and to prevent skidding when striking the track.

The tendency of the present is certainly toward better surfaces for our roads. This inevitably means that they must be so located as to secure easy grades. We cannot afford to build a hard surface on a road so steep that it would wash away on either side and underimne the surfacing. Motor truck traffic also demands that hard-surfaced roads have light grades on account of the load. A difference of 2 or 3% in grade can hardly be noticed on a road covered with 6 in. of mud. But cover it with 6 in. of concrete and a difference of ½ of 1% is noticeable. Thus, the location today must be made with a view to securing light grades. This does not mean, however, that it should be made absolutely flat. Money spent on cutting a grade below 1% had better be spent on building additional length of road.

Present day travel and traffic are not confined to neighborhoods nor even to counties, as was formerly the case. Long trips for both automobile and truck are common. This means that the roads must be as direct as possible. Although the neighbors did not complain when compelled to go half a mile out of the way by Mr. A's door, the people from the next town or next state much prefer to go straight and leave off Mr. A's house. This becomes important to the community also when an additional half mile means an additional cost of $15,000 to $20,000, in the case of a hard-surfaced road. So strong is the tendency nowadays to locate on the shortest routes possible that sometimes good sized villages and even towns are left to one side of a main highway. In cases of small towns with narrow, crooked streets, it is doubtless for the best interest of the great majority of the users of the highway to miss the town and allow it to have a branch road into it.

Another effect of motor truck traffic is to require much heavier bridges. As is the case with the roads, bridges need also to be wider than formerly. In view of the high cost of such bridges, good location will eliminate as many bridges as consistent with good alignment and will utilize such crossings as will make the cost of bridges a minimum.

The use of motor vehicles and the extension of travel beyond the bounds of local communities has had another marked influence on the location of highways. A few years ago a road was often located with but little or no regard to the roads of the adjacent counties or states. Sometimes you have heard it said, "If they want to come over here let them fix a way to get to our road." Now the case is different, except in rare instances. The road authorities in one county or state want to consult those in the adjoining county or state so as to insure a suitable connection. Two counties will now issue bonds for a joint bridge between them, whereas a few years ago one would have feared the other would steal its trade.

A consideration of these factors, which have merely been touched upon, shows that much is involved in the selection of a proper location for a highway. The location should be made only after thorough study of all conditions pertaining to the road under consideration and by a man experienced in weighing the relative importance of the different factors.

The chief factors affecting road location are, in the speaker's opinion, the following, listed in the order of their importance: (a) Drainage; (b) grades; (c) alignment; (d) present and probable future traffic; (e) cost.

In these days when so many different kinds of culverts and bridges are being constructed, streams and surface water are not such obstacles to road building as formerly. In general, the location of drainage structures is made to suit the location of the road, particularly on important highways. Often, however, relocation of existing roads can be made, and certainly new roads should be located, so as to utilize desirable stream crossings and well drained ground. One feature of location that is often neglected is that of following southern slopes of hills and providing for plenty of sunlight on the road. While we in this state are not hindered much by snow drifts and ice, we do suffer from mud holes caused by the road's being shaded all day long. Probably no other one thing can accomplish so much for a muddy stretch of road at the same cost as to cut off the shade or to relocate it on a southern exposure. This is, in effect, a form of drainage, since it helps to keep the road dry.

As indictaed before, the matter of grades is of greater importance today than ever before. There is, however, nearly always in hilly country a conflict between good grades and good alignment. In many cases suitable grades and alignment can both be secured by a judicious use of curves, without seriously increasing the cost. In cases where the two cannot be combined at low cost, however, neither should be sacrificed for the other if the road is one of much importance. The only alternative then is more expensive construction, using heavy cuts and fills when necessary. The death of a single person, caused by a bad curve, would more than offset the saving of a few hundred dollars in cost. Then too, with an expensive type of surface and the maintenance through a long period taken into consideration, the ultimate cost of the road with good grades and straight alignment may be less than that of one with poor alignment or bad grades. The addition of 1 mi. to the length of a road which carries an average of 100 motor vehicles per day costs the traveling public $3,650 additional per year, besides the extra cost of upkeep. This is equivalent to the interest on an investment of $73,000 at 5%. Hence from a business standpoint the public would be justified in such a case in spending a considerable sum to cut off the extra mile.

The location of a highway should also be made with due consideration to both present and future traffic. The amazing increase in volume of motor truck traffic and in the size of loads hauled within the past few years has upset many of our old ideas of road building and has shown us the necessity of looking to the future. It is equally important that we look to the future in our legislation so as to prevent unreasonable loads on the roads we are now building.

Along with the consideration of traffic requirements, present and future, arises the question of cost. In the past we were inclined to consider only present cost. We are beginning now to look forward to the cost of maintenance. County boards are now willing to spend thousands where formerly they hesitated about spending a few hundred. Sometimes our eagerness is so great for a smooth, hard-surfaced road, which so many people seem to think will last forever, that we are willing to spend far more than the traffic for years to come will justify. But regardless of the type of construction used at present, the location should be such as to provide efficient transportation at the lowest possible cost for maintenance. It is obvious, therefore, that there is need for thorough study of both present and future cost before we make final and fixed locations of our roads.

Roads of Porto Rico

Island Has Over 1,000,000 Inhabitant, but Only 150 Miles of Serviceable Roads—Start Has Now Been Made in Road Work and Improved Highways Will Greatly Increase Commerce

A country with more than 1,000,000 inhabitants and having but 150 mi. of serviceable roads, tells briefly the story of Porto Rico. This insular possession is the fourth largest of the West Indies. It is 100 mi. in length and has an area of 3,435 sq. mi.

Although in recent years this little country has adopted many of the modern methods of business and agricultural pursuits and although passenger automobiles and motor trucks are appearing in increasing numbers on the roads, there has been considerable lagging behind in highway development. Most of the roads—if they can be called such—are mires of mud which only oxen can push through, with light loads. In the higher sections in the interior the roads are rugged and entirely impassable to modern traffic.

OX TEAM SUPPLYING WATER FOR A STEAM ROLLER ON A PORTO RICAN ROAD

The only highways in Porto Rico which are in any way suited to modern traffic are the military roads which were built by the Spanish during their period of occupation of that island, or that have been constructed by engineers of the U. S. Government. The famous military road which runs around the island from San Juan to Ponce is the favorite highway for tourists and today many automobiles are seen on it. The country is hilly and picturesque and the road extends along the sea, at some places so close that the tourist may catch a glimpse of his reflection in the blue mirror.

With the increased agricultural and commercial activity of recent years many motor trucks have been imported, and the importance of road building is beginning to dawn upon the people. The accompanying illustration of oxen drawing water to a steam roller symbolizes the beginning of the transition from the old to the new. And now that road building is under way, it is safe to predict that in a few years the statement no longer will hold true that: "With all the richness of the soil of the island and with a people whose numbers are but little less than those who make their homes in Brooklyn, the entire trade of the island, both domestic and foreign, is less than that of many an American city with one tenth the number of inhabitants."

A representative of the Interchurch World Movement, who has been in Porto Rico in the interests of the industrial survey which the organization is carrying on, reports that with improved roads the business interests of that country could enlarge the sugar industry to many times its present volume.

New Los Angeles Speedway

Oval Timber Track, 1¼ Miles Long, with Grandstands Accommodating 30,000. Built in 100 Days at Cost of about $1,000,000

What is said to be a record in the building of automobile racetracks was made in the construction of the Beverly Hills Speedway near Los Angeles, Cal., which was completed in 100 working days. It was put up by the Los Angeles Speedway Association and cost about $1,000,000.

The track is oval in shape, and is built of wood. Most of the surfacing consists of 2x3's ripped out of 2x12's, the remainder being of 2x12's and 2x10's. The surfacing required a total of 1,400,000 ft. of lumber, and the entire structure, including the grandstands, required over 4,000,000 ft., mostly Oregon pine. The grandstands accommodate 30,000. The flatter parts of the curve are banked at an angle of 35 deg., the superelevation being somewhat greater at the sharper parts.

VIEW OF THE BEVERLY HILLS SPEEDWAY NEAR LOS ANGELES, CALIFORNIA—GRANDSTAND IN FOREGROUND

During the opening contest on the track, there were no accidents, and it is claimed that there is no other speedway in the country that can boast of an opening without an accident to either a driver or a spectator. A speed of 117 mi. an hour was made in the qualiyfing trials.

The Design and Construction of Different Types of Pavements*

Concrete

By A. N. JOHNSON
Engineer, Portland Cement Association

Before passing to the discussion of construction details proper it does not seem out of place to say a word as to the general conditions that control all highway construction.

The large road offerings during the past year and the yet larger ones pending for 1920 compel a consideration of factors that previously did not enter seriously into plans for construction of any type of pavement. But today the large amount of work which is to be done makes so great a demand upon all resources—transportation, production of materials, labor and contractors' organization—that it is imperative that every advantage be taken to conserve and make as effective as possible each of these controlling factors. Of all of them transportation or car supply is the most limited and will, therefore, control the amount of road actually completed in 1920.

The fact that in the spring there are more open-top cars available than at other times during the year emphasizes the necessity that maximum use be made of all cars that may be available during April and May for the transportation of road making materials and the storage of the same to be used in construction later in the season. The U. S. Bureau of Public Roads took the lead last fall in outlining the situation to the state highway departments, urging them to let contracts as early as possible that contractors, in turn, would be able to give orders for materials and equipment.

Such a program necessitates other changes from our procedure in the past. Payments to the contractor would necessarily have to be made so that he might receive a due amount for materials that were stored and work that had been performed, the results of which would not be available in finished construction until considerably later in the season.

In order to make the most of the limited labor supply it is necessary that more attention than ever be given to labor saving devices, and contractors' equipment should be as nicely balanced as possible so that each operation will coordinate with all other operations that are required and not cause delay because one portion of the work is improperly or unsufficiently equipped.

The whole situation is one that must be given very much closer study, both on the part of the engineers and the contractors. Each must assume new responsibilities if road production is to be brought to a maximum.

Subgrade

The employment of machinery makes possible refinements which would not be otherwise practicable. The preparation of the subgrade is an example in point. More study and care should be given this part of the work. I agree with those engineers who have expressed the opinion that the subgrade should receive little or no rolling. This is particularly true for heavy clay and gumbo soils. In general, it is recommended that the subgrade should be brought to within 1 or 2 in. of the desired elevation. The side forms should then be accurately set and the remaining portion of the subgrade carefully scraped or honed to the exact contour and elevation. This may be accomplished by a grading machine, which has been recently put upon the market, which may be operated so as to bring the roadbed to as nearly a true surface as is desired for the surface of the concrete, which is as it should be.

On those subgrades, in clay soils particularly, where drainage is especially precarious, and upon certain types of heavy gumbo soils which undergo considerable change with the variations between dry and moist conditions, it is recommended that a layer, 3 or 4in. thick, of cinders, sand, fine gravel or similar material be placed, upon which is laid the concrete.

Broad, flat shoulders will help greatly to minimize movement in the subgrade, due both to frost and moisture conditions. Narrow shoulders, bordered by deep ditches, form a condition to be avoided.

Side Forms

The use of the subgrading machine which runs upon the side forms emphasizes the necessity for having them carefully placed and solidly constructed. If heavy steel forms, preferably what is known as a ship angle shape, cannot be secured, then 3 or 4-in. wood forms are more to be desired than the lighter steel forms that have been used and which have proved so ineffective.

Joints

There is an increasing tendency on the part of many engineers to omit entirely expansion joints in the construction of concrete roads and there has accumulated ample experience to justify such practice. The chief advantage gained by omitting expansion joints is the avoidance of an uneven surface at the joints which often occurs unless extreme care is taken to place the joint and to finish the concrete surface in the immediate vicinity.

Reinforcement

The use of larger units of reinforcement, spaced wider apart than has been the custom, is gaining some preference. Particularly has the employment of bars ¾ in. in diameter laid along the edge of the pavement and cross-wise at intervals of 4 or 5 ft., proved to be a very practical and effective method. The use of reinforcement is strongly recommended for those portions of a road where the subgrade drainage is regarded as especially uncertain.

It is the practice in some localities to reinforce all the concrete in all the roads laid, but it would seem to be a more effective use of the reinforcement if it were omitted over stretches of road which were well drained, and an additional amount, over that used at present, placed in those sections of the road where the greatest difficulty is expected in obtaining good subgrade conditions.

The amount of reinforcement that is used, and that it is practical to use, from a cost standpoint, is not sufficient to add appreciably to the cross breaking strength of a concrete slab. It is absolutely erroneous, therefore, to consider that reinforcement in any wise replaces concrete and that a thinner slab may be laid with reinforcement than would be laid without it. If the amount of reinforcement were 30 or 40 times as much as is customarily employed there would be some basis for such a contention. Reinforcement is useful, not to prevent the formation of cracks, but to prevent a crack from opening and becoming of any appreciable size; and to this end a small amount of reinforcement is effective.

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*Paper presented at the 17th annual convention of the American Road Builders' Association, Louisville, Ky., Feb. 9 13, 1920.

Coarse Aggregate Tests

About one-third of the state highway specifications for concrete roads prescribe that the coarse aggregate shall have a French coefficient of wear not less than a certain grade, the higest grade prescribed being 12, while other states admit as low as 6 or 7. The French coefficient of wear was designed, as all highway engineers know, to test materials for macadam roads. The effect of traffic on pieces of crushed stone in a macadam road is quite different from that upon pieces of crushed stone imbedded in a concrete road. In the former all the pieces are subjected to wear; that is, due to the movement that occurs from the passage of a heavy vehicle the pieces of stone move and rub upon one another, thus creating what is known as internal wear. It is essential, therefore, that pieces of rock having a high resistance to wear should be used, and, because of this, it was seldom advisable to use in a macadam road rock having a French coefficient less than 12 to 14.

But in the concrete road there is no internal wear and, therefore, the French coefficient does not offer any criterion as to the adaptability of a given rock for concrete road work. There are many concrete roads which have been made of aggregate having a French coefficient as low as 7, subjected to very heavy traffic and showing, after a number of years' service, very little wear; no more than many other roads constructed with aggregate having a much higher French coefficient of wear. In fact, it can be stated that as between an aggregate having a French coefficient of 7 and one having a coefficient two or three times as great, there is no practical difference as to the wearing effect in a concrete road and that, therefore, there is no reason to exclude rock or pebbles that have a French coefficient as low as 6 or 7.

This point is discussed at some length by H. E. Breed, Consulting Engineer, New York City, in the February number of "Municipal and County Engineering," page 51.

Tests of Sand for Organic Impurities

Too few specifications make provision for testing sand for organic impurities. The test is so simple and can be made so readily by any engineer or foreman in the field that it is entirely practical; and, because it is of the greatest importance that no organic impurities be in the sand, such tests should be required by all specifications.

The test is made by shaking a few ounces of the sand in a 3% solution of sodium hydroxide and, upon settlement over night, observing the color of the clear liquid which, if colorless or at the most a light yellow, indicates freedom from organic impurities, whereas if the liquid is a decided amber or brown it is an indication of an amount of organic impurity which should not be permitted in concrete for road purposes.

But a small amount of organic impurity is sufficient to reduce the strength of the concrete to a third or a quarter of what it would otherwise be. In fact, but a comparatively small amount of organic impurity is necessary to cause complete disintegration of the concrete.

It is often true that many sands, apparently clean, will contain organic impurities in sufficient amount to make them dangerous for use in concrete road work. Sands having organic impurities may be washed and in most instances most of the impurity removed, but they should be afterwards tested to make sure there does not remain a harmful quantity.

Consistency

We have learned from the investigations of Professor D. A. Abrams, of the Structural Materials Research Laboratory, Lewis Institute, Chicago, that the strength of concrete depends absolutely upon the ratio of the amount of water to the amount of cement and that the use of more water than is necessary to produce a workable consistency or plasticity is merely wasting cement and producing concrete from one-third to one-half the strength that it would otherwise have. It is, therefore, important that our specifications contain some definite measure of the consistency desired. The majority of specifications at present merely describe the consistency of the concrete without providing any exact measure by which it may be ascertained

The slump test, using a truncated cone mold, has been developed by F. L. Roman, Testing Engineer of the Illinois State Highway Department, and answers every purpose and may be readily used in the field. The method of making the test consists of filling a thin metal mold in the form of a truncated cone, having an 8-in. base, 4-in. top and 12 in. high, with the freshly mixed concrete which is lightly tamped by a rod, as the concrete is placed in the mold. As soon as the mold is filled and struck with a trowel it is removed by means of handles on either side and the height of the concrete after removal of the mold is measured. The difference between this height and the height of the mold, or 12 in., is taken as the slump. For concrete in concrete road work a practical consistency is obtained when the slump is between ½ and 1 in. Less than ½ in. gives too stiff a mixture while more than 1 in. is unnecessarily wet, if the road is to be finished by a mechanical tamping machine. Where the surface of the concrete is struck by a template, worked by hand, it may be necessary to use a consistency corresponding to a slump of 1½ in.

In practice, the application of the test will be to mix a batch of concrete, knowing the amount of water used, and make the slump test. Accordingly as the slump measured is too little or too great more or less water should be used in the succeeding batches.

When the proper consistency has been obtained, as noted by the slump, there is little practical difficulty in securing a similar consistency by merely noting the appearance of the concrete. The consistency which gives the highest strength in the laboratory uses too dry a concrete for practical manipulation and has a rather mealy-dry appearance, whereas the consistency containing the least amount of water which will give a workable plasticity and, therefore, the strongest that can be made in actual work, is one which shows barely a glisten on the particles of the aggregate as they come out of the mixer. If the concrete has an appearance wetter than this the amount of water is unnecessarily large for practical handling in road work. If no more than 10 or 15% excess water is used it has cut down the strength of the concrete by nearly 50%. Too great attention cannot be paid to this important point of controlling nicely the amount of water used in mixing the concrete.

Proportions for Mixing Concrete

Professor Abrams' investigations have also demonstrated that the effect of variation in the grading of the aggregate upon the strength of the concrete is due to the fact that one grading may require a different amount of water for a given amount of cement than is required for a different grading to give in each instance the same workable plasticity. From the sieve analyses he has evolved a property of aggregates which he calls the fineness modulus which give a measure of the relative grading of different aggregates. The fineness modulus, he finds, is such a property of the aggregate that two aggregates within reasonable limits of grading with the same fineness modulus will, if mixed with the same amount of cement and water, produce a concrete of similar plasticity and will, in a given time, attain the same strength

He has shown further, based upon the results of many thousands of tests, that using the same proportion of cement with aggregates of different fineness moduli and securing in each instance the same plasticity, the strength of the concrete varies as the fineness modulus of the aggregate.

The sieve analysis of a given aggregate being known, the fineness modulus can be computed; and we may then determine the proportion of cement to use to produce a concrete of the desired strength. Thus, it is possible and practical to make concrete of equal strength of quite dissimilarly graded aggregates. For example, one aggregate may range from 3-in. pieces to the finer sand particles, while the second may contain no pieces over 1 in. in size. Yet by varying the proportions of cement, each of these aggregates may be used and the strength of the resulting concrete be the same in each instance.

This fact is of great importance, as we are enabled to use a wide variety of aggregates with regard to sizes and grading. Many supplies of aggregates now excluded by the narrow restrictions of our specifications may be employed and exactly as good concrete produced as that made under our present specifications. We have been somewhat inclined to develop a standard specification and have lost sight of the fact that it is not the specification that is to be standard but rather the product. If concrete possessing the same strength and durability can be made from aggregates having various gradings and limiting sizes then there is no reason to adhere to specificatinos which confine the selection of aggregates to those of a particular grading and exclude all others.

SIZES		FINE AGGREGATES, SCREEN OPENINGS PER INCH														
		0-28			0-14			0-8			0-4			0-⅜ in.		
COARSE AGGREGATES Inches	Cement in Barrels Aggregates in Cubic Yards	Cement	Fine	Coarse	Cement	Fine	Coarse	Cement	Fine	Coarse	Cement	Fine	Coarse	Cement	Fine	Coarse
No. 4 Screen to ¾	Proportions	1	1.3	2.4	1	1.6	2.4	1	1.8	2.3	1	2.0	2.3	1	2.7	1.5
	Quantities	1 96	.37	69	1.85	.44	.66	1 82	.48	62	1.75	.52	59	1.79	.72	.40
No. 4 Screen to 1	Proportions	1	1.3	2.7	1	1.6	2.6	1	1.8	2.6	1	2.0	2.5	1	2.6	1.8
	Quantities	1.90	.36	.76	1.77	.42	.68	1.72	46	66	1.67	.50	.62	1.72	.66	.46
No. 4 Screen to 1½	Proportions	1	1.2	3.1	1	1.6	3.2	1	1.7	3.1	1	2	3	1	2.4	2.4
	Quantities	1 82	.32	.84	1.58	.40	.79	1.63	.41	.75	1.61	.47	.72	1.62	.57	.57
No. 4 Screen to 2	Proportions	1	1.2	3.5	1	1.5	3.5	1	1.6	3.7	1	1.9	3.6	1	2.2	3.1
	Quantities	1 75	.31	.90	1,63	.36	.85	1.55	.36	.85	1.52	.43	.81	1.53	.50	.70
No. 4 Screen to 2½	Proportions	1	1.1	3.8	1	1.4	3.9	1	1.6	4.0	1	1.8	4.0	1	2.1	3.5
	Quantities	1 72	.28	.97	1.58	.33	.91	1.51	.35	.89	1.49	.40	.88	1.50	.46	.78
No. 4 Screen to 3	Proportions	1	1.1	3.9	1	1.4	4.1	1	1.5	4.1	1	1.7	4.1	1	2.0	3.7
	Quantities	1 69	.28	97	1.58	.33	.97	1.49	.33	.90	1.49	37	.90	1.49	.44	.81
⅜ to ¾	Proportions	1	1.3	2.3	1	1.7	2.3	1	1.8	2.3	1	2.2	2.2	1	2.8	1.4
	Quantities	1.96	.37	.67	1.85	.46	.63	1.82	.51	.62	1.75	.57	.57	1.79	.75	.37
⅜ to 1	Proportions	1	1.3	2.6	1	1.7	2.6	1	1.9	2.5	1	2.2	2.4	1	2.7	1.7
	Quantities	1.90	.36	74	1.77	.44	.68	1.72	.48	.64	1.67	.54	.59	1.72	.68	.43
⅜ to 1½	Proportions	1	1.3	3.0	1	1.7	3.0	1	1.9	3.0	1	2.1	2.9	1	2.6	2.2
	Quantities	1.82	.35	.80	1.68	.43	.75	1.63	.46	.73	1 61	.50	.68	1.62	.63	.53
⅜ to 2	Proportions	1	1.3	3.3	1	1.7	3.4	1	1.8	3.6	1	2.0	3.4	1	2.4	2.9
	Quantities	1.75	.34	.85	1.63	.41	.83	1.55	.42	.84	1.52	.45	.77	1.53	.62	.66
⅜ to 2½	Proportions	1	1.3	3.7	1	1.6	3.7	1	1.7	3 9	1	2.0	3.8	1	2.3	3.3
	Quantities	1 72	.33	.95	1.58	.37	.87	1.51	.37	.87	1.49	.44	.84	1.50	.51	.74
⅜ to 3	Proportions	1	1.2	3.8	1	1.6	3.9	1	1.7	4.0	1	1.9	4.0	1	2.2	3.5
	Quantities	1 68	.30	.95	1.58	.37	.91	1.49	.37	.88	1.49	.42	.88	1.49	.48	77
½ to ¾	Proportions	1	1.5	2.3	1	1.9	2.2	1	2.1	2.2	1	2.3	2.1	1	2.8	1.3
	Quantities	1.96	.44	.67	1.85	.52	.61	1.82	.58	.59	1.75	.59	.54	1.79	.75	.34
½ to 1	Proportions	1	1.5	2.5	1	1.9	2.5	1	2.1	2.4	1	2.3	2.4	1	2.8	1.6
	Quantities	1.90	.42	.70	1.77	.50	.66	1.72	.53	.64	1.67	57	.59	1.72	72	.41

SIZES		FINE AGGREGATES, SCREEN OPENINGS PER INCH														
		0-28			0-14			0-8			0-4			0-⅜ in.		
COARSE AGGREGATES Inches	Cement, in Barrels Aggregates in Cubic Yards	Cement	Fine	Coarse	Cement	Fine	Coarse	Cement	Fine	Coarse	Cement	Fine	Coarse	Cement	Fine	Coarse
½ to 1½	Proportions	1	1.4	2.8	1	1.9	2.9	1	2.1	2.9	1	2.2	2.8	1	2.7	2.1
	Quantities	1.82	.37	.75	1.68	.47	.73	1.63	.51	.69	1.61	.52	.66	1.62	.65	.51
½ to 2	Proportions	1	1.4	3.3	1	1.9	3.3	1	2.0	3.4	1	2.2	3.3	1	2.7	2.7
	Quantities	1.75	.36	.85	1.63	.46	.79	1.55	.46	.78	1.52	.50	.74	1.53	.62	.62
½ to 2½	Proportions	1	1.4	3.6	1	1.8	3.6	1	1.9	3.7	1	2.1	3.7	1	2.6	3.1
	Quantities	1.72	.35	.91	1.58	.43	.85	1.51	.42	.83	1.49	.46	.81	1.50	.57	.69
½ to 3	Proportions	1	1.3	3.7	1	1.8	3.8	1	1.8	3.9	1	2.1	4.0	1	2.4	3.3
	Quantities	1.68	.33	.92	1.58	.42	.89	1.49	.40	.86	1.49	.46	.88	1.49	.53	.63
¾ to 1	Proportions	1	1.7	2.4	1	2.1	2.4	1	2.4	2.1	1	2.6	2.2	1	3.1	1.5
	Quantities	1.90	.48	.68	1.77	.55	.63	1.72	.61	.53	1.67	.64	.55	1.72	.79	.39
¾ to 1½	Proportions	1	1.7	2.7	1	2.0	2.8	1	2.3	2.7	1	2.5	2.7	1	3.0	2.0
	Quantities	1.82	.46	.73	1.79	.50	.70	1.63	.55	.65	1.61	.59	.64	1.62	.73	.48
¾ to 2	Proportions	1	1.7	3.1	1	2.0	3.1	1	2.3	3.1	1	2.5	3.0	1	3.0	2.4
	Quantities	1.75	.44	.80	1.63	.48	.75	1.55	.53	.72	1.52	.56	.67	1.53	.68	.55
¾ to 2½	Proportions	1	1.7	3.3	1	2.0	3.5	1	2.3	3.4	1	2.4	3.4	1	2.9	2.8
	Quantities	1.72	.43	.84	1.63	.47	.83	1.51	.52	.76	1.49	.53	.75	1.50	.64	.62
¾ to 3	Proportions	1	1.7	3.5	1	2.0	3.7	1	2.3	3.7	1	2.4	3.6	1	2.8	3.1
	Quantities	1.68	.43	88	1.58	.47	.87	1.49	.51	.81	1.49	.53	.79	1.49	.62	.68
1 to 1½	Proportions	1	1.7	2.8	1	2.0	2.9	1	2.3	2.7	1	2.6	2.6	1	3.1	2.0
	Quantities	1.82	.46	.75	1.68	.50	.73	1.63	.55	.65	1.61	.62	.62	1.62	.75	.48
1 to 2	Proportions	1	1.5	3.2	1	1.9	3.5	1	2.2	3.3	1	2.4	3.3	1	3.0	2.6
	Quantities	1.75	.39	.83	1.63	.46	.85	1.58	.51	.76	1.52	.54	.74	1.53	.68	.59
1 to 2½	Proportions	1	1.4	3.4	1	1.9	3.8	1	2.0	3.7	1	2.3	3.7	1	2.7	3.1
	Quantities	1 72	.35	.86	1.58	.45	.89	1.51	.44	.83	1.49	.51	.81	1.50	.69	.69
1 to 3	Proportions	1	1.3	3.6	1	1.8	4.0	1	2.0	3.9	1	2.2	3.9	1	2.7	3.3
	Quantities	1 67	.33	.90	1.58	.42	.94	1.49	.44	.86	1.49	.48	.86	1.49	.59	.73

ABRAMS' TABLE OF PROPORTIONS AND QUANTITIES FOR ONE CUBIC YARD OF CONCRETE

Until we had before us the results of the investigations of Professor Abrams we could not have said with any precision just what difference should be made in the proportioning of aggregates of different sizes in order to produce concrete of a given strength. This, we are now able to accomplish; but it is not necessary here to enter into a further discussion of the principles involved. For those who desire to study the matter more thoroughly reference may be made to the bulletins of the Structural Materials Research Laboratory, Lewis Institute, Chicago, particularly Bulletin No. 1.

Under our standard specifications today for fine aggregate we are limited to the use of material varying from ¼-in. size particles down to the finer materials, specifying that it shall be reasonably well graded between the smaller and larger particles. Suppose, however, there is available a quantity of sand containing no particles larger than ⅛-in. or possibly containing no particles over ¼-in. Are we to throw away these sands or may we use them, varying the proportions so as to produce the same strength concrete as obtained with the sand containing ¼-in. particles?

Our specifications today for coarse aggregate, while they vary somewhat more than for fine aggregate, yet restrict the choice of materials to very narrow limits, the sizes usually specified varying from ¼-in. particles to 2-in., some as high as 3-in. and a number limiting the larger sizes to 1½ in. But we have at hand, let us say, a large amount of material which contains no particles less than 1 in. in size carrying from that to 2 in. or possibly to 3 in., or there is other material available containing nothing less than ½ in. and perhaps nothing over 1 in. The question is, can we use such aggregates which vary so widely from our present specifications in such a way as to produce concrete as strong and durable as with the aggregates that comply with our present specifications? From the discussion that has been made of Abrams' work we know the answer to be "yes."

Professor Abrams has prepared the accompanying table which puts the results in a practically available form.

The basis upon which this table has been constructed is the production of a concrete that experience has shown will have sufficient strength and durability for its purpose. There have been many miles of concrete roads built using a 1:2:3 mixture with the fine aggregate varying from ¼ in. size material to the finer particles and the coarse aggregate varying from ¼-in. material to 1½ or 2-in. size pieces. Such a concrete tested under laboratory conditions, using 6x12-in. cylindrical test specimens, and with a plasticity that secures a practical workability, gives very closely, at 28 days, a compressive strength of 3,000 lb. per square inch. This was taken as a basis upon which the table has been prepared.

Five different fine aggregates were selected varying, as the table will indicate, from the finest which contains no particles over 1-28-in. and others not over 1-14, ⅛, ¼ and ⅜-in. in size, respectively. A wide selection of coarse aggregates is given beginning with the first group which has the smaller limit of size at ¼-in., while the larger limit varies from ¾-in. to 3-in. In the second group the lower limit for the coarse aggregate is ⅜-in. with sizes for the upper limit varying from ¾-in. to 3-in. Similarly there are groups with the lower limit at ½-in., ¾-in. and 1-in., respectively, the upper limits in each group varying in sizes to 3-in., making in all 27 variously sized coarse aggregates, each in turn combined with 5 different fine aggregates or sands, thus making 135 combinations of fine and coarse aggregates, each of which is proportioned so as to produce under practical working conditions as to consistency the same strength concrete. In all cases it is to be assumed that all aggregates that are to be used, irrespective of size or grading, are to be of material structurally sound, clean and free of organic impurities.

It should be mentioned that Professor Abrams' tests demonstrated that the resisatnce to abrasion of concretes varied as the compression strength, the greater the strength, the greater the resistance to wear; and that concretes of equal crushing strength gave about equal resistance to abrasion.

In the practical application of the table we first have to define how to determine what is the upper limit of size for a given aggregate. Should any sand containing a few ¼-in. particles be classed as one varying from zero to ¼-in., or should there be required a certain percentage of material between the ¼-in. size and the next lower lmiit, as shown in the table, which is ⅛-inch? The proper allowance, Professor Abrams tells us, should be 15%; that is, a fine aggregate with ¼-in. particles which did not contain 15% by volume of the material passing the sieve with 4 openings to the inch and retained on a sieve with 8 openings to the inch, should be classed as ⅛-in. sand and not as ¼-in.

The following rule is to be applied to determine the limits of sizes for the coarse aggregate: There shall be not less than 10% of material between the largest size and the next smaller size shown in the table. Thus, a coarse aggregate to be classed as 2½-in. size shall have not less than 10% of the material between the 2½-in. size and the 2-in. size. If there is less than 10% between the 2½-in. size and the 2-in. size it should be classed as 2-in., providing there should be at least 10% of the material retained upon the 1½-in. screen.

The lower limit of size of a coarse aggregate shall be the largest size shown in the table for coarse aggregate below which there is not to exceed 10% by volume of the material. Thus a coarse aggregate in which the lower limit of size is to be 1-in. should be an aggregate in which there is not to exceed 10% by volume of the material passing the 1-in. screen. In all coarse aggregates if there is to exceed 5% of the volume passing a ¼-in. sieve, then such excess shall be considered as fine aggregate and the amount of fine aggregate to be used is to be modified accordingly.

It will be noted that in addition to the proportions by which to combine the various fine and coarse aggregates with the unit quantity of cement there is also given the quantities of the materials to be used to make 1 cu. yd. of concrete. These quantities are given in barrels and hundredths of barrels for cement and in hundredths of cubic yards for the fine and coarse aggregates. The quantities shown do not make any allowance for waste from any source, so that for practical estimates they should be increased from the amounts shown, as experience in handling the work according to the particular method to be employed has indicated as necessary.

The following example will make clear the practical use of the table:

It will be supposed that one sand is that usually specified, from ¼-in. down, and must be shipped in at a cost of $2 per cubic yard and that one coarse aggregate, varying from ¼-in. to 2-in., must also be shipped in at a total cost of $3 per cubic yard; that there is available locally a supply of sand and coarse aggregate, each being rather fine, the sand varying from ⅛-in. down, which costs $1.50 per cubic yard, while the coarse aggregate varies from ¼-in. to 1-in. and may be secured at a cost of $2.50 per cubic yard. The cement in each case is assumed to cost $3 per barrel. The cost of a cubic yard of concrete, using the materials to be shipped in would then be as follows:

1.52 barrels cement	@	$3.00	$4.56
.43 cu. yd. of sand	@	2.00	.86
.81 cu. yd. of coarse aggregate	@	3.00	2.43
Total cost of materials for 1 cu. yd. concrete			$7.85

Using local materials the cost would be:

1.72 barrels cement	@	$3.00	$5.16
.46 cu. yd. of sand	@	1.50	.69
.66 cu. yd. of coarse aggregate	@	2.50	1.65
Total cost of materials for 1 cu. yd. concrete			$7.50

In this instance the local aggregate, although fine and requiring more cement, will produce a yard of concrete at less cost. In general it will be found that the use of finer sand or of finer aggregate increases the amount of cement, the opposite being true for coarser sizes. Thus, a coarse aggregate with all of the fine material removed, varying from 1 in. to 3 in. in size, combined with sand varying from ¼ in. down, uses 1.49 bbl. of cement, whereas an aggregate varying from 1 in. to ¼ in. combined with the same sand, ¼ in. down, requires 1.67 bbl. of cement for a cubic yard of concrete.

If the producer of aggregate materials can say what are the sizes of aggregates he can furnish, they can be used to make a concrete of a given strength. Should concrete of a strength other than 3,000 lb. per square inch be desired, then another table would be calculated, with the proportions and quantities required accordingly; but the table given here is confined to the use of concrete for concrete roads where a better quality and greater strength are required than is necessary for concrete for many other structures.

A specification to include this table would provide a section somewhat as follows:

Specifications for Proportions Using Abrams' Table

The proportions of cement, fine and coarse aggregate for the concrete shall vary according to the sizes of the fine and coarse aggregates to be used as indicated in Abrams' Table of Proportions and Quantities, as printed herewith. One sack of cement is to be considered as one cubic foot and proportions are to be by volume. The quantity of cement in a cubic yard of concrete, in place, shall be not less than the amount as shown in the table for a given proportion of coarse and fine aggregates.

Before work is started the contractor shall advise the engineer of the particular sizes of fine and coarse aggregates he expects to use and no change shall be made by the contractor from such sizes except upon due notice in writing to the engineer.

To determine in what classification a given aggregate shall fall the following method shall prevail:

For fine aggregate there shall be not less than 15% of the total volume between the coarsest size and the next smaller size shown in the table. Thus, if fine aggregate is to be classed as No. 4 screen, there shall be not less than 15% of the material between the No. 4 screen and the No. 8 screen.

In coarse aggregate there shall be not less than 10% of material between the largest size and the next smaller size shown in the table. Thus, a coarse aggregate to be classed as 2½-in. size shall have not less than 10% of the material between the 2½-in. size and the 2-in. size.

In each instance, whether fine or coarse aggregate, if there is not of the coarser sizes the amounts as here described, the upper limit of size of the material is to be that of the next smaller size. That is, an aggregate that contains some 2½-in. material, but less than 10% between 2½-in. and 2-in., is to be classed as 2-in. size for the upper limit.

The lower limit of size of a coarse aggregate shall be the size shown in the table for coarse aggregate below which there is not to exceed 10% by volume of the material.

If there is to exceed 5% of the volume of coarse aggregate passing the ¼-in. sieve, then such excess shall be considered as fine aggregate and the amount of fine aggregate to be used shall be modified accordingly.

Aggregate falling between limits of sizes other than shown by the table may be used only upon special written permission of the engineer and in such proportions as he may indicate.

In all cases, aggregates, both fine and coarse, are presumed to be reasonably well graded between the limits specified.

Specifications for Consistency

The amount of water to be used for mixing concrete shall be that which will give a consistency to be determined as follows:

Newly mixed concrete shall be placed in a truncated cone shaped metal mold having an 8-in. base, 4-in. top and 12 in. high. The concrete shall be lightly tamped with a rod as it is placed in the mold, which when filled is to be immediately removed by means of handles on either side of the mold and the slump or settlement of the concrete noted. For concrete to be finished by a mechanical tamping machine the slump shall not be less than ½ in. nor to exceed 1 in. If the concrete is to be finished by hand methods the slump may be as much as 1½ in.

Construction of State Highways[*]

Work of the Engineers in State Road Construction in Nebraska—Types of Roads; Earth, Sand-Clay, Gravel, Concrete and Brick—What Must be Done by Railroads, by Highway Officials, by Contractors and by Others

By A. S. MIRICK[†]

The subject of the construction of state highways is a very broad one and, as many features of the subject will be taken up in detail by speakers who are specialists in their lines, I will take up only certain phases of the subject which may be worthy of discussion, together with other construction matters that have been forcibly brought to my attention during my experience as a highway engineer.

The first class of roads that I will discuss consists of earth roads. There are about 80,000 mi. of earth roads in the state and no matter how great a hard-surface program we launch, this day and generation will pass by with at least 75,000 mi. of earth roads still with us.

Some have questioned whether earth road improvement could be called permanent improvement. There are certain features of an improved earth road that are permanent improvements. They are: (1) The establishing of low maximum grades; (2) straightening or correcting the present alignment of the road, and (3) building permanent structures.

The establishing of a low grade and the determining of proper alignment of the road are important and are products of considerable study in the preparation of plans.

The laying out of the grades and center line for the guidance of the contractor by the project engineer has been one of the chief sources of discussion between the engineer and contractor during the present season.

The project engineer must cross-section his work ahead of the contractor, adjusting the grades where an excess or under-run of dirt is encountered; give slope stakes for the guidance of the contractor; stake out structures and inspect same; prepare weekly and monthly reports, and also submit his monthly estimates. He is, therefore, a busy man and, unless he keeps well ahead of the contractor, grief is his portion.

This year, we are going to avoid these troubles by getting out parties early on their work; having them carefully check all of the bench marks established by the preliminary parties; set new benches where required, and then set a row of stakes at least 100 ft. apart where they will not be disturbed during the progress of the work or by the tenants living along the road. These stakes will have marked upon them the station, the distance from the face of the stake to the center line and the cut or fill from the top of the stake to the finished center of the road.

The project engineer will also be required to mark all trees and brush that are to be removed and see that the clearing is at least 1 mi. ahead of the contractor. He will also mark each telegraph or telephone pole with a distance right or left that it must be moved to clear the work, and finish negotiations concerning the removal of these obstacles with the company that owns them so that no delays will be suffered by the contractors and the owners will have ample time to remove the poles.

The most important matter in the construction of earth roads is the finish. After the work has been brought to grade, roughly, finishing stakes are set by the engineer and the contractor blades his road continuously until a smooth, compact surface is secured, as indicated by the stakes.

A question that always arises when the subject of earth roads is discussed is, how are you going to finish your back slopes, especially are you going to require hand dressing? This is answered very easily. If a contractor is careful he can slope his cuts in such a way that the terraces made by his disk are so slight that the action of the weather will soon put them in satisfactory shape. Other contractors are sloppy and butcher their work in such a way that the mattock is the only tool that will correct their rough back slopes. It is not our intention to require hand work on back slopes and if the contractor will use reasonable care he can avoid it. There are several attachments for an elevating grader that will cut back slopes—some of these have been recently patented and will be put on the market. It is also possible to cut slopes up to 6 ft. with a blade grader.

The finish of a road is important, for the verdict passed by the traveling public, whether a road is good or bad, is based entirely on how it rides and how it looks.

(Continued on page 188)

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[*] Paper presented at the Nebraska Road Institute, University of Nebraska, Lincoln, Neb., March 1-5, 1920.

[†] Chief Constuction Engineer, Nebraska Department of Public Works.

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

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LARGER ROAD UNITS

The committee report on the question of abolishing township and district boards as road construction and maintenance authorities, printed elsewhere in this issue, brings up a matter about which there has been endless discussion.

The whole history of road work indicates that efficiency is seldom secured by small administrative units. As pointed out in the closing sentence of the report, there have been few, if any, cases in which "any but satisfactory results have attended the transfer of road construction and maintenance from local to state supervision." But this is not evidence that the state is the smallest administrative unit that can achieve efficiency; it merely proves that the state is a sufficiently large unit. As a matter of fact, entirely satisfactory results can be obtained by much smaller units—sometimes, even by townships.

In order to secure good work at an economical cost, the unit must be large enough to afford to employ engineering talent of a high order in the design and supervision of the work; to attract contractors of ability and responsibility; to permit of adequate financing; and to make possible the utilization of adequate plant—if the work is done by day labor or force account instead of by contract. These considerations, rather than mere area, determine the effectiveness of any unit.

Unfortunately, political considerations will have more to do with the settlement of the question than will engineering considerations. The tendency, however, is towards centralization of authority, and it is reasonable to hope that, in the future, at least the more important work will be carried out under the control of units large enough to achieve the desired results.

WASTE IN ROAD BUILDING

The literature of good roads is full of references to the great waste that has attended road building. Definite figures are seldom if ever given, but the amounts that are alleged to have been squandered are characterized as "stupendous," or "enormous," or are referred to as "millions of dollars."

Some money has been wasted, without doubt. It would be quite impossible to carry out so great a volume of work as has been done in the improvement of the country's roads since a real start was made, without a very considerable waste. But has this waste been as great as is claimed?

In the building of an entirely new road, or in carrying out improvements involving such general reconstruction as was common in much of the earlier work, it would be impossible to waste any very large proportion of the total amount expended unless an utterly useless location were made. Well built drainage structures are very nearly permanent, and even comparatively poorly built culverts and bridges have a fairly high salvage value. Grading, if on a usable location, is as nearly permanent as human work can be.

It is evident then that the greatest waste in former years occurred in the construction of wearing surfaces—indeed, it is probable that the authors of statements about the great wastes in road work generally have this particular part of the work in mind. The surfacing is not lasting; it can be regarded only as temporary. But even the most inferior pavement is not without some value as a foundation for some future wearing course or as a subgrade for a better base course. But it must be remembered that in the earlier work, the cost of the wearing surface was a relatively small part of the whole cost. In not a few instances, it was practically negligible. Obviously, in such cases the waste was nearly nil.

The work done in one state particularly well illustrates this point. Its activities were controlled by a man who was commonly described as a "practical" road builder, the term being one of opprobrium or approbation, depending upon the mental slant of the speaker. His subordinates used to make plans and profiles and send them in to the chief to have lines and grades established. One instrument, apparently, a long straight-edge, was used for both, and straight roads with true grades were the result. It happened that many of these improvements were grading jobs; that is, little or no attention was paid to the matter of surfacing. The lines and grades were straightened and the roadbed was smoothed and rolled, a thin gravel or macadam course sometimes being added. Inasmuch as this particular man was a stickler for drainage, little of the money expended under his direction could truthfully be called "wasted," even though many of the roads he built have since been "reconstructed" by the laying of expensive pavements.

There were other men like him engaged in road work all over the country, and they wasted very little money. There were others, of course, who did waste, who wasted with both hands. But, taking them as a body, the early road builders built well and economically. Their successors followed and are following in their footsteps, though because of changing traffic conditions and the greater proportionate cost of providing wearing surfaces, they have a more difficult task.

On the whole, it seems likely that the sums wasted in road building have not been nearly so large as has been claimed.

Should the Township and District Board Be Abolished and a Road Construction and Maintenance Unit?*

In considering this report it should be understood that the committee appointed to deal with this question has been unable to hold a meeting and such suggestions as are here set forth are those which have passed between three members of the committee and the chairman.

It seems to be the unanimous opinion of the members of the committee that from the road user's point of view the abolishment of the township board as a road construction and maintenance unit would be highly desirable. As a general thing, this board is composed of men elected to office. In practically all cases they are without any technical knowledge with respect to road building, and in most cases they lack practical knowledge of the work in hand. It is customary also, to change these officers in most townships about every two or three years, so that the men charged with the care of township roads never become proficient in this work by experience.

It is true, on the other hand, that at the present time from 85 to 90% of all the highways in practically every state are under the jurisdiction of local officials, because in no state has the state assumed control of more than from 10 to 15% of the entire road mileage for purposes of construction and maintenance. In this connection it should be borne in mind that traffic surveys conducted by the Bureau of Public Roads in several counties in different parts of the United States have always disclosed the fact that from 10 to 20%, of the highways carry 90% of the traffic of any given area; and the further fact should be borne in mind that the advocates of a federal highway system are asking that only from 2 to 4% of all highways be included in such system.

While the question of road improvement has been actively agitated in this country for the past 30 years, no particular improvement has been made except on the limited mileage in each state under the control of the state highway department. In many states the effort to secure initial appropriations for launching improved road work has been stupendous and it is to be doubted whether state governments could be induced to undertake financing very much larger programs of road improvement than they now have under consideration.

The majority of the committee are not familiar with road district organizations, but it appears to them that it might be advisable, especially for purposes of maintaining and improving ordinary dirt or gravel roads, to group several townships into a road district or road unit so that it might be possible to employ a trained man to look after this work. This would also make it possible to purchase proper equipment to be used throughout the district, where it is impssible for each of several towns to equip themselves properly for the care of even dirt roads, to say nothing about building and maintaining high types of pavement.

Such organized effort would also lead to better business administration of road funds, better accounting and better reporting of work done, than generally pertains today. Successful results under organized road districts would seem to be largely a question of organization and the selection of trained superintendents and foremen.

Objections to removing road work from the control of local officials might be expected from the old-line politicians who like to get as many candidates as possible upon a ticket at election time so as to get out a large number of voters. While many of the present local road officials are holding office at a sacrifice and at considerable personal inconvenience, we apprehend that most of these officials would object strenuously to any change in the present system.

As indicated above, we believe that a much better grade of work would result from expenditure of present funds if the work were properly organized and directed—as would be possible under larger units. We are not prepared to say, however, just what the unit ought to be. It might be the county. It seems certain, however, generally speaking, that state highway departments ought not be charged with the responsibility. We know of no case where any but satisfactory results have attended the transfer of road construction and maintenance from local to state supervision.

Construction of State Highways

(Continued from page 186)

Passing on to the subject of surfaced roads, I will first take up the sand-clay surfaced road. On many of our projects it is necessary to surface with clay in order to carry the traffic over the sand. I will not discuss their construction, for they are famliiar to all here. The greatest difficulties we have had in their construction this year are the lack of tim to study the clay supply, the reluctance of the county boards to secure R. O. W. for this work and the utter inability of some contractors to understand the scope of the work. The clay supply in the future will be carefully located, car taken to see that the supply is sufficient for the required work. I believe that the solution of obtaining the material is that before the plans are approved the county commissioners should certify in writing that all right of way necessary for both the construction work and for the required borrow pits has been secured.

Several projects for gravel surfacing have been let during the past year, totalling about 50 mi. This work has been done by the state, using its own equipment, and good results have been obtained The gravel produced in thi state is fine in texture, a very small proportion being retained on a ¼-in. screen. There are two sources of supply, river gravel and bank gravel. The river gravels are clean and it is necessary to mix them with clay in order to have them compact readily. The bank gravels usually have clay mixed with them and compact under traffic more readily than the river gravels.

Government trucks have been used to great advantage for the graveling of our roads. When they were delivered, however, it was necessary to equip them with suitable bodies. Consequently a number were equipped with wooden bodies having inclined floors. These bodies held about 2 yd. and were equipped with a swing end-board, hung at the top. This end-board could be raised and the vibration of the truck would dump its load cleanly and evenly on the road. The cost of operating the trucks on the road varied, according to the condition, from 30 to 40 ct. per cubic yard-mile Next year, by the use of trailers, this haulage cost will b decreased greatly.

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*Committee report presented at the 17th annual convention of the American Road Builders' Association, Louisville, Ky., Feb. 9-13, 1920.

Committee: Paul D. Sargent, Chief Engineer, Maine State Highway Commission, Chairman; F. R. White, Chief Engineer, Iowa State Highway Commission; Geo. C. Diehl, County Engineer of Erie County, New York; Frank Page, State Highway Engineer of North Carolina; C. P. Fortney, Chairman, West Virginia State Highway Commission.

Gravel used for surfacing was produced by pumping and by using a clamshell bucket. The material was then delivered to bins or storage piles and either loaded directly into the trucks from the bins or delivered from the storage piles by means of automatic loaders.

Experience has shown us, during the past season, that it is best not to try to build our gravel road in a single course of from 6 to 8 in., as in other states where the gravel is really gravel, but to build it in courses that will readily compact, then strengthening the weak spots. Where we have to mix a binder with the material a thickness of 4 in. is about as great as it is practicable to make it. If the material contains binder it is better, to lay the gravel in 2-in. courses. We have also found that to wait until traffic packs down the gravel is a tedious and waiting process; consequently next year rolling will have to be resorted to.

In dealing with the subject of hard roads, I will take up only concrete and brick construction. Macadam roads exist in this state, but owing to the limited supply of stone, I doubt very much if they will be extended greatly. Personally, I have supervised nearly 1,000 mi. of this class of construction, and have had good results, especially with bituminous macadam. I will also omit asphalt pavements from this discussion, as they will be handled by specilists later in the program.

Concrete roads are being constructed in several sections of the state. The most important piece of construction is at Fremont. Mr. Brown, Project Engineer, in charge of this work will give you a paper on this work; therefore, I will not go into details. We are also constructing concrete overflow pavements in the Platte Valley and many concrete glides or spillways. There are a few points that I hope to hear discussed at this institute. They are as follows: (1) Shall we reinforce paving slabs? (2) Are expansion joints desirable? (3) Shall we roll the subgrade? (4) Advantages of a concrete mixing plant.

I believe that Nebraska could save thousands of dollars on its concrete paving and base work if studies were made so that all of our local materials could be utilized. I desire to see compression and abrasion tests made on all of our materials, using a standard slump and varying the mixes from each source of supply, so that we would know definitely just what proportions of cement would be necessary to make the materials of the different sources of supply come up to a required standard; also to know how one material compares with another in strength when made into concrete .

It may be interesting to know that we have about 10 mi. of this class of pavement under contract now. Six miles of brick pavements have been constructed by state and federal aid. This paving was constructed of a 3-in. vertical fiber block laid on a sand cushion 1½ in. deep over a 5-in. concrete base, the width of the pavement being 18 ft. The brick was filled with asphalt and is the only type the state is now specifying, both the monolithic and the semi-monolithic types having been discarded. Iowa is specifying a sand cement cushion with an asphalt filler. I trust this type of construction will be discussed, as I believe it to be an innovation.

National and industrial conditions will curtail the building of hard-surfaced roads this year, the most serious cause being transportation—lack of cars and poor distribution Along this line let me quote from a bulletin issued by the National Sand and Gravel Producers' Association which I think is pertinent:

"What the Railroads May Do: (1) Place in service all existing equipment; (2) keep available equipment repaired to fullest extent; (3) provide for prompt switches and movement of loads and empties; (4) purchase new equipment, including both cars and locomotives; (5) Rate plants as to their capacity and distribute cars on that basis without discrimination, as between commodities.

"What Highway Officials May Do: (1) Award contracts in the winter months, so that delivery of materials may begin early in the spring when usually open top cars are plentiful; (2) where laws will permit, allow estimates on delivered materials whether in storage at unloading station or on the site of the job; (3) award highway contracts in long stretches, so that contractors will be justified in providing equipment for handling materials expeditiously.

"What Contractors and Other Consumers May Do: (1) Arrange for early and regular delivery of materials; (2) provide for storage at points of delivery and on site of job whenever practicable; (3) unload cars promptly, using special equipment for such purpose when conditions warrant.

"What Producers May Do: (1) Keep plants in good repair to avoid break-downs and thus prevent delays in loading; (2) load cars to maximum capacity; (3) trace cars to destination and report to proper railroad officials unnecessary delays in movement."

———OOO———

Haldimand County, Ontario, Canada, has awarded a $250,000 contract for water-bound macadam roads in that county.

The Illinois State Highway Department has awarded contracts for the construction of 39 mi. of highways at a total cost of $1,252,187.

The Construction of 50 mi. of Roads in Cook County, Illinois, will be started shortly. It had been originally planned to construct 70 mi. of highway, but increased costs have made it necessary to curtail the prongram. To pay for this work the county has advertised the sale of the $2,000,000 bond issue recently voted.

The City of Hibbing, Minnesota, with a population of 12,000, is to be moved to another location and will remove 40,000 yd. of wooden paving block and lay them in the new streets. Hibbing is situated in the iron district of northern Minnesota and must make way for the operations of the United States Steel Corporation. Included in the structures to be moved is the city hall. This building is valued at $100,000 and it will cost $80,000 to place it in the new location.

The Advisory Committee of State Highway Officials, which consults with Federal Government officials on federal policies in road building, is to be increased from six to twelve members, according to a statement made to the executive committee of the American Association of State Highway Officials during a recent conference at Washington. The enlarged committee will include all of the members of the executive committee of the state highway officials' organization. This step, according to the announcement, was decided upon with a view to securing a more complete representation of all parts of the country.

Rord Work in Boone County, Indiana, is meeting with unusual difficulties. Although twelve road projects have been advertised four different times, no bids from contractors have been received, it being reported that the contractors regard the estimates of the engineers as entirely inadequate. Recently bonds for the construction of seven gravel and concrete roads, aggregating $166,600 were offered for sale by the treasurer of Boone County, but not one bid was received and it is reported that the contractors on the roads will suspend operations unless money is forthcoming.

HIGHWAY TRANSPORTATION

Garford Motor Truck Company Establishes Transportation Engineering Department

The Garford Motor Truck Co., of Lima, Ohio, has organized a new department, designated as the transportation engineering department, the duties of which will be to gather authoritative information on the operation of motor trucks and to aid present owners to obtain the lowest cost per ton-mile.

This department will investigate the operation of motor trucks in various parts of the country, obtaining data relative to operating costs in actual service. Exhaustive investigations will be made of the details entering into the operation and maintenance of trucks in use, including problems in loading and routing, methods of delivery, housing, repairing and driving. From the data thus collected it is expected to determine the cost per ton-mile in haulage operations.

Motor Trucks to Solve Haulage Problems While Railroads are Being Reorganized

By G. A. KISSEL*

Just before the railroads were returned to private ownership on March 1, the heads of the different railroads, through the press, asked the public to help during the period the individual owners of the lines were getting back into harness.

The different statements the presidents issued showed that they realized that it was going to take time before their properties could measure up to the full demands of the country. But, as Howard Elliott, President of the Northern Pacific said, "It will be done more quickly if the public will cooperate and will be patient over inconveniences and delays because of the inability of the railroads to produce at once the quantity and quality of transportation that the public needs."

Likewise, A. D. Loomis, President of the Lehigh Valley, said, "The public must be patient during the test period." Mr. T. DeWitt Cuyler, Chairman, Association of Railway Executive, said, "There will be a tremendous pressure behind service to secure traffic. Greater effort will be made to satisfy shippers and passengers. Supervision will increase in effectiveness."

A. H. Smith, President of the New York Central Lines, said, "The greatest difficulty now is sufficient equipment. Without sufficient equipment the lines cannot properly function, and the farmers, merchants, manufacturers and citizens will be seriously affected until this condition is remedied. What are required are equipment and facilities to supply the maximum requirements of the people."

From the foregoing it can be seen that the rail chiefs, realizing that the railroad equipment is insufficient to fully meet the nation's shipping and transportation requirements, are going to do the best they can under the circumstances; and they ask the public to have patience until they bring their equipment up to that point of efficiency where the railroads can function properly and prove equal to coping with all requirements. This we should all do by every means in our power. Ways and means must be found to make up for this lack of equipment, and it is here that the motor truck will be pressed into service in greater quantities than during the past two or three years.

It is fortunate that the motor truck has outgrown its swaddling clothes and has grown into a full-fledged transportation unit, because without its adaptability and economy, the country's shipping schedules would indeed be in a chaotic condition. Without a doubt, when the rail chiefs have put into effect the many new plans and ideas they will evolve to "efficiencyize" the railroads, they will probably be the most highly efficient railroads in the world, but between now and that time, the nation's production schedules must be kept up; in fact, they must be increased, which is possible only through having a distributing channel that will not be interrupted or clogged up.

Disribution is a vital necessity to the life of the nation. In every branch of industrial, commercial and governmental activity it is as necessary as an outlet to a river. Without an outlet the inlet soon causes a destructive flood. With a production program turning out millions of tons of goods, if there is no distribution it soon floods warehouses, terminals and freight yards, choking not only industrial growth, but industrial progress.

The main trouble seems to be that there are not enough freight cars to supply the proper quantity to each industry. For instance, the Government requires so many thousand freight cars; industry—such as iron, coal, steel—demands so many thousand freight cars; agricultural America demands so many thousand freight cars to move the nation's crops and foodstuffs; after which come the different branches of commercial America—the manufacturers, the raw material makers, jobbers and retailers.

Therefore, if there are not enough cars to go all around, the best the railroads can do is to apportion a fair amount to each business and then that business has to make up that shortage the best it can.

This was the situation several years ago, and business men in looking around for other transportation units to make up the shortage found only one that could be adopted with any degree of success and efficiency—the motor truck.

Since its adoption by industrial America it has not only proven itself adaptable to the requirements of every line of business in the country, but in addition has proven very economical and efficient.

Meeting emergency demands in such an efficient manner caused American business men to use the motor truck extensively, and as the country gradually expanded and increased its production schedules, the motor truck was required in greater numbers to meet this expansion.

And why not? The motor truck is practically the same as a railroad freight car, ton for ton. Like its railroad brother, it is a piece of machinery that needs care and attention, efficient routing and careful driving, with the added advantages of not requiring a definite right of way nor leaving goods several miles from the consignee's door.

The motor truck owner and driver who appreciates the present transportation situation and operates his trucks efficiently and economically, will not only help the railroads at a time when they need help, but will himself benefit greatly through increased transportation efficiency and lower transportation cost.

There is no question about it; if the motor truck is operated along a well planned and carefully thought-out schedule, the cost of delivering goods by motor truck will be reduced quite considerably over the present cost, which is considered low as compared with other transportation methods. The motor truck is essentially a long distance overland transportation unit, built to haul a given tonnage of goods mile after mile, day in and day out, at a given speed that compares very favorably with the average speed being maintained by other transportation units. It is built to stand up under freight haulage work. Every moving or fixed unit in its chassis or frame is designed to do its share in the work of standing up under the load and helping to move it forward. The American motor truck manufacturer leaves nothing to chance—every inch is designed by engineers who have studied motor truck transportation requirements and conditions, and it receives the closest inspection. There is nothing questionable about these trucks in so far as their construction and ability are concerned.

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*President, Kissel Motor Car Company.

There remains then the remaining factor in the successful adoption of the motor truck—that of the owner and driver. The owner looks at his truck from an investment standpoint—it represents so many miles of transportation, the quantity depending on the care given the truck. He should see to it that when it is placed in commission the party who has charge of that truck realizes the dividends he expects from it and will operate it in a way that will insure those dividends being paid.

And likewise, the motor truck driver. There is a proper way of driving a truck as well as an improper way; there is a proper way of loading and unloading a truck; of taking care of it at the end of its day's work. It is up to the truck owner to realize this and make sure that his truck driver knows the proper ways.

Just as the railroads are starting out to build up transportation efficiency, so too should the motor trucks in America be put on a highly efficient operative basis. It would not only help the railroads to a greater extent, but it would mean an added increase in saving of time and money and would greatly aid industrial America in meeting and measuring up to its transportation requirements.

Predicts National Development of Motor Truck Haulage System

Association in Cities of Central West Formed by Trucking Companies Will Unify Activities of Motor Transport Interets

A union depot for motor freight has been established in Toledo, O., by several independent trucking firms carrying on interurban motor transportation. The building is a modern structure of two floors and basement and is equipped with electric elevators and other machinery for the speedy handling of freight. The establishment of this and other motor freight depots throughout the country, has caused E. A. Williams, Jr., President of the Garford Motor Truck Co. to say:

"The rapid development of the motor truck express in various communities will result shortly in a network of routes extending over the country. With the amalgamation of trucking interests and the improvement of the highways, this system will become a great factor in the nation's transportation.

"Without a unity of purpose there is a certain waste in transportation—a loss of tonnage hauled. Naturally this results in increased costs. The creation of highway transportation commissions in various states and the organization of transportation bureaus in cities has resulted in eliminatng much of this capacity waste.

"These associations, comprising the leading motor haulage concerns in the community, are centralizing trucking activities. The Toledo association, for instance, maintains for the mutual benefit of truck owning members and those whom they serve, a central office and a secretary-manager. In this office an accurate check of trucks is kept on a large blackboard. The moment a member has a truck not in use he notifies the secretary and the truck is immediately posted as idle. Another member, whose trucks are all in operation, may receive a request from a shipper. He notifies the secretary and the idle truck belonging to the first member is placed in service.

"In inter-city hauling trucks are operated so systematically that they are assured of cargoes both ways. Rate schedules are based on the cost-plus plan and the association provides members a course of instruction which teaches the proper way to determine expense of operation.

"Detroit, Cleveland, Akron, Pittsburgh and other cities in the Central West recently have established similar bureaus and all are being interwoven into one vast system. The various associations are now serving territory within a 100-mi. radius of their respective cities.

"With the organization of these associations in several more of the large centers, as now contemplated, the motor truck express system in the Central States will be practically complete. There seems to be little doubt that it will then spread rapidly to other sections and eventually throughout the country."

PUBLICATIONS

PROVINCE OF ONTARIO, DEPARTMENT OF PUBLIC HGHWAYS. Annual report for the year 1918. Paper, 6½x10 in., 80 pages and covers. Illustrated.

This report covers in detail the work carried on by the department, with special reference to the work done by the several counties of Ontario under the Act to Aid in the Improvment of Public Highways. Included in the report are the Motor Vehicle Act, the Municipal Act respecting highway bridges and a report of a meeting of the Ontario Good Roads Association held in March, 1919.

WHAT IS THE EVENTUAL STREET CLEANING METHOD? A review of the methods of street cleaning methods now being used and developed. By George C. Dodge. Paper 10½x7½ in., 56 pages and covers. Illustrated.

The author discusses street cleaning methods in the following order: The hand patrol, the horse-drawn sweeper, the squeegee, flushing, motor-driven combination machines and vacuum cleaning, examining the relative merits and defects of each method. While no definite answer is given to the question propounded, it is intimated that vacuum cleaning may at some time be the standard method.

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The Commissioners of Warren County, Pennsylvania, recently conferred with State Highway Commissioner Sadler for the purpose of ascertaining if the law permitted them to build roads under the direction of an engineer and to purchase machinery and materials. Owing to the high cost of road building materials the commissioners feel that they can save $10,000 per mile by eliminating the contractor and are holding up the work in Warren County awaiting the decision of the state highway commissioner.

A $100,000 Road Bond Issue of the Lebanon Special Road District, Laclede County, Missouri, has been returned to the commissioners by the prospective purchaser, the Bank of Commerce, of Springfield, Mo. An investigation undertaken by attorneys for the bank disclosed the fact that the Legislature passed a law permitting districts to issue bonds in an amount equal to 10% of the assessed valuation, but failed to repeal a previous statute limiting the issue of bonds to 5% of the assessed valuation.

MEETINGS

Calendar of Coming Meetings

Apr. 12-17—United States Good Roads Association—Eighth Annual Convention, Hot Springs, Ark. Director General, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

Apr. 16-17—Bankhead National Highway Association—Fourth Annual Convention, Hot Springs, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

May 10-11—American Association of Engineers.—Annual meeting, St. Louis, Mo. Secretary, A. H. Krom, 63 E. Adams St., Chicago, Ill.

May 13-15—League of Texas Municipalities.—Eighth annual convention, Dallas, Texas. Secretary, Frank M. Stewart, University of Texas, Austin, Texas.

PERSONAL MENTION

C. L. Nelson has resigned as city engineer of Muskegon, Mich.

A. S. Calkins was recently appointed city engineer of Joliet, Ill.

Amos Melberg has resigned as county engineer of Benton County, Iowa.

J. P. Howe was recently appointed town engineer of Arnprior, Ontario, Canada.

M. E. Crough was recently appointed town engineer of Paris, Ontario, Canada.

E. M. Bourke was recently appointed city engineer of North Bay, Ontario, Canada.

Earnest Drinkwater was recently appointed city engineer of St. Lambert, Quebec, Canada.

Thomas Lough has succeeded J. M. Hansen as assistant state engineer of North Dakota.

B. H. Dowler has been appointed road superintendent of Glouster County, Ontario, Canada.

C. B. Smith has been appointed roads inspector of Sherwood Municipality, Sask., Canada.

Ernest Smith, of Edmonds, B. C., has been appointed municipal engineer of Burnaby, B. C.

A. M. West has resigned as city engineer of North Vancouver, B. C., to go into private business.

F. A. Martin, Assistant County Engineer of Shawnee County, Kansas, died recently in Waukesha, Wis.

Joseph Firth, formerly City Manager of Charlotte, N. C., is now city manager of West Palm Beach, Fla.

R. C. Hamm was recently appointed engineer of Ford County, Kansas, with headquarters in Dodge City.

L. Herbert Kidd has resigned as city manager of Knoxville, Tenn., to become city manager of Kingsport, Tenn.

James N. Gladding, formerly City Engineer of Albuquerque, N. M., has been appointed city manager of that city.

J. M. Hansen has resigned as assistant state engineer of North Dakota to enter private engineering practice.

J. A. Murray, Jr., has been appointed principal assistant engineer in the Albany, N. Y., Bureau of Engineering.

J. P. Spooner, Jr., was recently appointed assistant engineer of San Joaquin County, California, in charge of highway maintenance.

Roderic Pearson has been transferred from the Portland, Ore., office to the Missoula, Mont., office of the U. S. Bureau of Public Roads.

George O. With has resigned as city engineer of Joliet, Ill., and is now manager of the Chicago office of the Consolidated Expanded Metal Co.

H. E. Frech has been placed in charge of the St. Louis office of the Portland Cement Association. Mr. Frech was formerly city engineer of Hannibal, Mo.

E. J. Owens, formerly Office Engineer of the St John and Quebec Railway, is now office engineer of the Department of Public Works, New Brunswick, Canada.

J. W. Lowell, formerly eastern manager of the service bureau of the Uinversal Portland Cement Co., has succeeded G. E. Warren as assistant manager of the bureau.

C. M. Butts has been appointed chief assistant to Martin C. Polk, engineer of Butte County, California, and will assist in planning the work under the recent $1,800,000 bond issue.

David Hanna has resigned as chief of surveys and drafting of the Roadways Department, Toronto, Canada, to accept the position of superintendent of water-works at Windsor, Ont.

Max L. Cunningham has resigned as state engineer of the Oklahoma Department of Highways and is now vice president and chief engineer of the Municipal Excavator Co., of Oklahoma City, Okla.

A. P. Denton, formerly district engineer of the Dallas office of the Portland Cement Association, is now in charge of the San Francisco office as district manager. Mr. Denton has been at the Dallas office since 1916 and prior to that time was with the engineer's office of King County, Washington.

Charles A. Clark has succeeded A. P. Denton as district engineer of the Dallas office of the Portland Cement Association. Before joining the staff of the association in 1917, he was resident engineer for the Illinois State Highway Department in charge of concrete road and bridge construction.

H. Eltinge Breed, M. Am. Soc. C. E., consulting engineer of New York City, has been placed in charge of the courses in highway engineering in the School of Applied Science of New York University. Mr. Breed has served as assistant chief engineer on the Coleman du Pont Road in Delaware and has also served in various positions with the New York State Highway Commission and the Department of the State Engineer and Surveyor of New York. In 1915 he was made first deputy commissioner of the New York State Highway Department, from which position he resigned last year to enter upon the practice of consulting engineering.

GOOD ROADS

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*Illustrated article

Baldwin Locomotives

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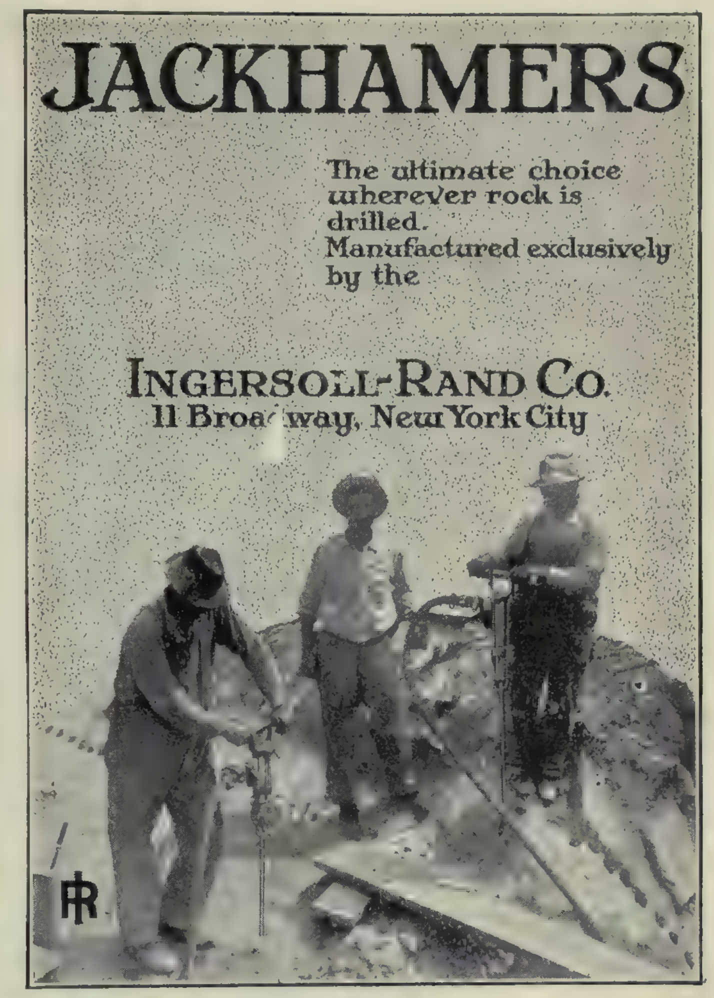

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Asphaltic Concrete on Old Macadam

The Advantages of Asphaltic Concrete Wearing Surfaces Laid on Old Macadam Roadways as Foundations—Examples of Successful Use Under Widely Varying Climatic Conditions—Construction Methods

By W. R. MACATEE*

How to reclaim the hundreds of miles of macadam roads in this country!

That is the problem which city, county, and state engineers face as the result of ever increasing automobile and truck traffic. This problem, however, dwindles into easy solution when it is considered that macadam roads furnish splendid foundations for the permanent types of highway such as sheet asphalt and asphaltic concrete. In numerous localities in various parts of the United States old macadam roads have been utilized as foundations, and the results have been lasting pavements, in addition to a great saving in time, effort, and money. Not a few engineers have made the mistake of destroying their old macdam roads to make way for other types of foundation, but now that old macadam as a foundation has passed the experimental stage and has proved to be durable and lasting, these mistakes are rarities.

Must Determine Thickness

The thickness of a macadam roadway is one of the prerequisites to its availability to serve as a foundation. The minimum thickness of the road must be one of the first things to be determined, and this is best done by making a series of test holes, bored at various intervals in the road. Theory and experience show that an old macadam road should have a minimum thickness of 4 in. on the sides and 5 to 6 in. in the center in order to be used satisfactorily as the foundation for 2 in. of asphaltic concrete or some other high type of asphaltic construction.

Preparation Necessary

Macadam roads at times wear unevenly under the stress and strain of a traffic they were not built to carry. Before using such roads as the foundation for asphaltic pavement, they should be brought to an even contour. The low spots should be filled with an asphaltic binder course and then rolled. Care should be taken not to remove too much of the old road's metal, and where it is necessary to remove some metal the material surrounding the part excavated should be disturbed as little as possible. When scarifying

PAVEMENT SURROUNDING PARLIAMENT BUILDING AT TORONTO, ONTARIO, CANADA—TEXACO ASPHALTIC CONCRETE ON OLD MACADAM BASE

ROAD FROM BILTMORE STATION EASTERLY TOWARDS FAIRVIEW, BUNCOMBE COUNTY, NORTH CAROLINA—TEXACO ASPHALTIC CONCRETE ON OLD MACADAM the old road is desirable, the same care should be taken in regard to distorting the metal in the roadway, and a heavy roller should be run over the road after the scarifying is completed. Advocates of old macadam roads as foundation for asphaltic construction maintain that cracks are less likely to appear in the wearing surface with such a foundation than with a rigid concrete foundation.

---

*Eastern Division, Asphalt Sales Department, The Texas Co.

The record in the accompanying table of instances, under widely different conditions, where old macadam roads have been used as bases for asphalt wearing surfaces will indicate the worthiness of this type of base for reclamation and further use.

STREETS IN VARIOUS CITIES PAVED WITH ASPHALTIC WEARING SURFACES ON OLD MACADAM

Highland Avenue, Birmingham, Ala.	Laid in 1904
Dartmouth Street, Boston, Mass.	Laid in 1903
Commonwealth Avenue, Boston, Mass.	Laid in 1915
Sheridan Road Blvd., Chicago, Ill.	Laid in 1906
Columbia River Highway, Oregon	Laid in 1913
Swannanoa Road, Buncombe County, N. C.	Laid in 1917
Main Street, Lexington, N. C.	Laid in 1919
Fort Riley, Kansas	Laid in 1918
Buchanan County, Mo.,	Laid in 1919
St. Joseph, Mo.	Laid in 1912
University Avenue, Toronto, Canada	Laid in 1912
Pie IX Boulevard, Montreal, Canada	Laid in 1916
Washington Park Drive, Chicago, Ill.	Laid in 1912
Dixie Highway, Fayette Co., Ky.	Laid in 1916

In all, 8,000,000 sq. yd. of this type of construction have been used satisfactorily throughout the country.

The writer is more familiar with the reclamation of the old macadam highways in Buncombe County, North Carolina, than wtih any of the other projects named. In that county old macadam pavements were first tried out in 1916, when the city of Asheville resurfaced with Texaco asphaltic concrete a number of worn-out roadways. This method of construction proved so meritorious that the county commissioners of Buncombe County the following year adopted the same means of permanently paving the road leading from the gate to the entrance of the late George Vanderbilt's palatial home "Biltmore," near Azalea, where the Government afterwards constructed a mammoth hospital for returned soldiers who had been gassed in France.

Over this road was transported all of the heavy material, consisting of thousands of truck loads, for the construction of this large hospital. Some of the loads weighed 30,000 lb. Today the road is in perfect condition in spite of the fact that the old macadam had worn extremely thin before the asphalt pavement was laid. The Buncombe County officials have since paralleled this road with asphaltic concrete on old macadam, leading from the village of Biltmore, and extending to Fairview. This road will shortly become a part of the famous "Coast to Mountain" hard-surfaced highway which will traverse the entire length of North Carolina and which will make that state a Mecca for tourist and commercial traffic.

Doesn't Delay Traffic

In addition to the mentioned advantages of using old macadam pavements as base structures for asphalt pavements, one should not overlook the very important fact that this type of paving permits continuance of traffic at all times and does away with the necessity of the long and tedious detours that are necessary under certain construction conditions. Ordinrily, 21 days are required for "final set" to take place in cement concrete. This delay, and consequent inconvenience and disadvantage, is not necessary in asphalt construction where macadam, stone, or gravel base is used. Asphalt pavements on such foundations may be used for the heaviest traffic several hours after laying.

Specific Case

A specific example of the efficacy of this type of construction is the "Fairview Road," Buncombe County, North Carolina. When the macadam wearing surface had been thoroughly swept and cleaned to receive the new asphalt wearing surface there was revealed a very irregular but firm foundation surface. This resulted from "pot holes" worn in the old macadam and from the cutting of ditches at various times. To this uneven foundation was applied an asphaltic concrete binder course of sufficient thickness to bring the surface to the proper grade and elevation. A 2-in. asphaltic concrete wearing surface was then applied to half the roadway, while traffic was permitted on the other half.

Curbs

In planning a wearing surface for old roadways, the fact should not be overlooked that a satisfactory edging or curb is necessary to prevent lateral displacement of the pavement. Several types of edging or curbing are adaptable to resurfacing of this character, such as cement concrete, stone, metal, or plank—or a bituminous macadam shoulder, 2 or 3 ft. wide, which may be satisfactorily used instead of curbing, and which also gives an increase in the width of road available for use, and at minimum cost.

In view of the high cost of the maintenance of macadam pavements many communities will do well to adopt the above described type of construction, which possesses all of the qualities of permanence, cleanliness, and other desirable features of asphalt pavements.

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The Indiana State Board of Tax Commissioners, on March 10 approved of the following bond issues: St. Joseph County, Portage Township, Donovan Road, $33,000; Wabash County, Chester Township, Coble Road, $66,000; Harness Road, $90,000; Walts Township, Anderson Road, $11,000.

Twenty-five per cent. of the Roads of Ontario, Canada, will be improved during the present year, according to W. A. McLean, Deputy Minister of Public Highways. He also advocates the expenditure of $60,000,000 during the next five years on the 40,000 mi. of roads in the province.

The Record of Testimony Supporting the Jones-Reavis Bill before the Senate Committee on Public Lands has been printed and a limited number are available for distribution. Copies of this testimony for the bill, which proposes to establish a national department of public works, may be secured from the Engineering Council, McLachlen Bldg., Washington, D. C.

Two Bills to Amend the New Jersey Motor Vehicle Law were recently introduced in the Legislature of that state. One would permit the use of more than one trailer with a motor truck and the other would permit the use of iron-tired trailers to be operated on the public highways at not more than 6 mi. an hour. These proposed measures allow a wider field for the use of trailers than under the existing law.

The Automobile Club of Southern California plans to form a vigilance committee of 200 prominent business men to prevent accidents and thefts of motor cars in that section. Each member will be pledged to report all infractions of the traffic laws observed by him by means of post cards furnished for that purpose. This movement arises from the rapid increase of motor vehicles in the city of Los Angles and surrounding territory. California now has, it is reported, more automobiles per capita than any other state, with one to every six inhabitants. In Los Angeles County there is one-third of the total number in the state, with more than 141,000 motor vehicles registered in this county.

Status of State Aid to Counties, and Its Future Development-I[*]

Mr. President and Gentlemen:

Your committee on the "Status of State Aid to Counties and its Future Development" begs leave to make the following report:

A careful research has been made to determine the present status of state aid to counties in road construction and maintenance. Brief statements of the procedure followed by all of the states have been prepared and are available to be made a part of our report. [These statements are appended to this report—Ed.]

It is revealed that 44 of the 48 states grant financial aid or its equivalent in convict labor either to counties or towns, in accordance with some plan, for road construction or maintenance or both. Three of the remaining states extend aid in the form of advice or assistance in the preparation of plans, and of only one state can it be said that no definite assistance is granted by the state.

But though the extension of state aid is thus shown to be practically a nation-wide policy, there are wide divergencies between the policies of the states in regard to the manner in which the aid is extended, in the magnitude of the aid, and in the machinery which is prdvided for the construction and mantenances of the state-aided roads.

Generalizing, it is possible to report that:

1. Thirty-five states grant money or convict labor aid to the coutnies for the construction of roads and bridges.

2. Two states grant financial aid to counties for the construction of roads but not of bridges.

3. Three states render financial aid to counties or towns or both for the construction of roads and bridges.

4. Four states render financial aid to towns for the construction of roads and bridges.

5. In thirty-three states construction is executed under the practically complete supervision of the state highway department.

6. In seven states the state highway department exercises only very limited supervision over construction.

7. Four states which grant financial or convict labor aid exercise no supervision whatever over the roads which are constructed with state aid.

8. In five states the roads constructed with state aid are maintained entirely at the expense of the state.

9. Twenty-two states provide a part of the cost of maintaining the state aid roads constructed.

10. Sixteen of the states which grant substantial aid for road construction take no part, financially, in the maintenance of the aided roads.

11. In one state the counties are required to pay the entire cost of maintaining earth roads, and one-half the cost of maintaining gravel roads, but the state assumes the entire expense of maintaining the higher types of road constructed with its aid.

12. Twenty of the states provide for the maintenance of state aid roads under the full supervision of the state department.

13. In eighteen states the maintenance of state aid roads is executed either under the partial supervision of the state, or the state is provided with means to compel satisfactory maintenance by the counties or towns.

14. Five states provide for the maintenance of state aid roads by the counties, entirely free of state supervision or control.

15. In one state there is no definite provision for the maintenance of state aid roads after they are constructed.

16. The maximum proportion of the cost of constructing state aid roads paid by any state is 80%, and minimum 8%, the prevailing arrangement being an equal division of the cost between state and county or town. In a few states owners of abutting property pay a part, usually 10%, of the cost. In other states the proportions to be paid by state and county are not fixed, but are determined by special agreement for each project.

Still other states provide for different proportions of aid to be granted to the counties or towns, according to the assessed valuation of the property of the local division, the plan being to grant greater aid to the poorer local governments.

17. The part of the cost of maintenance paid by the state varies from the whole cost to no part whatever, but in the matter of maintenance, as in the case of construction, the equal division of the cost by state and county is the most common arrangement. A few states allot a fixed sum annually for the maintenance of each mile of road constructed.

18. Roads to be improved with state and local funds are, in some states designated by the local governments, in others by the state department, and in others state money is expended only for the improvement of parts of an established system of roads. In the latter group the method of establishing the system varies. In certain states it is established by the state department after public hearings have been held in which the wishes of the various local interests have been presented; in others the system is selected by the counties and the state department acting in cooperation; in others it is selected by the state department, with or without the advice of the counties, and established or promulgated by act of the Legislature; and in others the system is fixed by legislative enactment in the bill creating the state department. There is a marked tendency toward the adoption of state systems, and an increasing number of the states favor the establishment of such systems by law.

19. As there is wide variation in all other phases of state aid administration so, also, is there considerable variation in the manner of apportioning the state funds available for aid to the counties or towns. In a few states the apportionment is made by and in the discretion of the state department; in at least one state a fixed annual sum is granted to each county; in others the state funds are apportioned in proportion to one or more of the following factors: area, population, rural road mileage, mileage of designated road, amount of county road and bridge funds, assessed valuation of property, and amount of state road tax. Of these, the method of division according to the assessed valuation of the property of the counties or towns is the most popular.

The foregoing is a rough summary of the present status of state aid in the various states. The differences in the procedure in the various states are partly the result of heterogeneous development by the states, but partly due, also, to the effect of differences in environment and local conditions.

In so far as the differences in procedure which exist are based upon actual differences in local conditions, whether of law, population, topography or other feature, it is the opinion of your committee that they cannot be accommodated to a uniform standard. But to the extent that they are the result of independent, unadvised development, it is believed that the present procedure in many of the states may be improved by conforming to a standard based upon the best features of the procedures of all the states.

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[*] Committee report presented at the 17th annual convention of the American Road Builders' Association, Louisville, Ky., Feb. 9-13, 1920.
Committee: T. Warren Allen, General Inspector, Bureau of Public Roads, U. S. Department of Agriculture, Chairman; W. R. Neel, Chief Engineer, Georgia State Highway Department; R. L. Saunders, Deputy State Highway Commissioner of Connecticut; Ira R. Browning, State Road Engineer of Utah; A. W. Graham, State Highway Engineer of Missouri; M. W. Watson, State Highway Engineer of Kansas.

The committee proposes the following as such a standard:

1. That state aid funds be expended only for the construction and maintenance of a well defined system of state aid roads, including necessary bridges, selected by the proper county officials, approved, or amended and approved, by the state highway department, and promulgated by act of the state Legislature.

2. That state funds available for state aid construction be apportioned to the various counties or towns in the ratio that the assessed valuation of property and the mileage of designated road in each local division bears to the total assessed valuation of property and the total mileage of designated road in the state.

3. That an amount of state funds estimated to be necessary to maintain previously constructed state aid roads and bridges be annually reserved from the whole amount of the funds available before the apportionment of funds for construction is made.

4. That the cost of construction of roads and bridges be borne equally by the state and local subdivision, whether county or town, except that in towns or counties the assessed property valuation of which is less than a certain predetermined amount the proportion of the cost borne by the state may be increased, but not beyond 75%.

5. That surveys, plans and specifications for state aid roads and bridges be prepared by the state highway department and be submitted to the governing local body for approval.

6. That state aid road and bridge construction be under the full supervision of the state highway department.

7. That final payment for state aid construction be delayed for a period of 30 days after the actual completion thereof, and that the highway authorities of the local subdivision have the right, at any time during such period, to object to final payment on the ground of unsatisfactory work.

8. That state aid roads and bridges, after completion, be maintained by the state highway department at the joint expense of the state and local government, sharing as for construction.

STATEMENT OF EXISTING PROCEDURE BY STATES

Alabama

1917 Procedure: The state rendered financial aid to counties for the construction of roads and bridges.

Funds for state aid were derived from the state convict fund, and were divided equally among the counties for use with an equal amount of county funds. No allotment to any county might exceed $4,000 annually. State convicts might be assigned.

Surveys, plans, etc. of state aid roads and bridges were made by the county engineer or by a state engineer detailed as resident enginer. Such surveys, plans, etc. were required to be approved by the state highway engineer.

Construction of state aid roads and bridges was carried out under the immediate supervision of the county engineer or state resident engineer. Frequent inspections were made by the state highway engineer or his authorized representative during construction and prior to acceptance by the state.

Sate aid roads were maintained by the counties with county funds under the instruction, and subject to the approval, of the state highway engineer. In case of failure by the county, maintenance was executed under the direct supervision of the state highway engineer and the expense thereof was deducted from future allotments of aid to the county.

Changes by Legislation Since 1917: The 1919 legislation provides for full state supervision over the design, construction and maintenance of state trunk roads, including bridges, and for the payment of the full cost or any part of the cost by the state acting alone or in cooperation with the counties.

Arizona

1917 Procedure: The state rendered financial aid to counties for the construction of roads and bridges.

Funds for state aid work were derived from a state-wide tax of 1 mill divided into two funds known as the "25% fund" and the "75% fund." The "75% fund" was divided among the counties in proportion to the amount of tax collected in each county. The "25% fund," the motor vehicle fund, and a special fund for the use of convict labor, were used for roads and bridges in any county in the discretion of the state engineer with the Commission of State Institutions.

The roads for improvement by state aid were selected by the county supervisors, and surveys, plans, etc. were made by the state engineer and forwarded to the county supervisors for approval. State aid roads included bridges in line of roads.

Construction of state aid roads was under the general supervision of the state division engineer and his assistants.

After construction the roads were maintained by the state, using either the "75% fund" or the "25% fund."

Changes by Legislation Since 1917: There have been no changes in the procedure as outlined for 1917.

Arkansas

1917 Procedure: The state rendered financial aid to the counties for the construction of roads and bridges.

State aid was allotted to the counties on the basis of recommendation made in each particular case by the advisory board of the State Department of State Lands, Highways, etc. to the State Highway Commission. Provision was made for the use of state convicts, the salary of warden and guards to be paid by the state and the other expenses thereof to be paid by the county.

Surveys, plans, etc. for state aid roads and bridges were made by the county, subject to the approval of the State Highway Commission.

Construction of state aid roads was supervised by the state highway engineer.

After construction it was required that the roads be maintained by the county with county funds raised by a 3-mill tax, the maintenance to be in accordance with rules and regulations if the State Highway Commission, and the county court was required to pledge its good faith in maintenance if the construction were undertaken.

Changes by Legislation Since 1917: There have been no changes in the procedure as outlined for 1917.

California

1917 Procedure: The state rendered financial aid to counties for road construction, but granted no aid of any character for bridge construction.

The total cost of state aid road construction was borne one-third by the state and two-thirds by the county.

Surveys, plans, etc., were prepared by the counties, subject to the approval of the State Highway Commission.

Construction was under the supervision of the county engineers.

After construction, state aid roads were maintained by the county under state supervision and inspection, the cost thereof being borne equally by the state and county.

Changes by Legislation Since 1917: There have been no changes in state aid procedure since 1917.

Colorado

1917 Procedure: The state rendered no financial aid to counties for the construction of roads and bridges. Convict labor aid was furnished to the counties, the allotment being made with the approval of the warden of the State Penitentiary. All excess expenses in connection with such employment were required to be borne by the counties.

The state exercised no supervision over the preparation of plans, etc., for the roads on which state convicts were used, nor did state officials have any supervision over the construction of such roads.

The roads when built were maintained entirely by the counties without the aid or assistance of state officials.

Changes by Legislation Since 1917: There have been no changes in the procedure as outlined for 1917.

Connecticut

1917 Procedure: The state rendered financial aid to towns for the construction of roads and bridges.

In towns with an assessed valuation exceeding $1,250,000 the state paid three-fourths of the cost of construction. In towns with assessed valuations of $1,250,000 or less the state paid seven-eights of the cost of construction. The state aid roads were designated by the town selectmen, with the approval of the state highway commissioner.

Surveys, plans, etc. for roads and bridges were made by the state and submitted to the town selectmen for approval.

Construction was under the full supervision of the State Highway Deparment.

After completion the roads were maintained by the State Highway Department, the towns paying one-fourth of the cost.

Changes by Legislation Since 1917: The 1919 legislation makes allotments to towns continuous and limits the annual expenditure which may be made in any one town to $10,000, with certain exceptions. Provision is also made for the payment of part of the cost of bridges on trunk line roads by the towns, the part to be paid by the towns being made to vary according to the valuation of property and other factors.

Delaware

1917 Procedure: The state rendered financial aid to counties for the construction of roads and bridges.

A fund of $10,000 was donated annually to each of the three counties in the state, provided an equal amount were appropriated by the county.

In New Castle County surveys, plans, etc. for state aid roads were made under the supervision of a state highway commissioner who, it was provided, might also be the county engineer. In Kent and Sussex Counties there was no provision for the participation of the state in the preparation of plans, etc.

In New Castle County the construction of state aid roads was under the supervision of the state highway commissioner of that county, but in Kent and Sussex Counties the state's allotment was spent entirely under the supervision of county officials.

After completion, state aid roads became the sole property of the counties and there were no state requirements for the maintenance thereof.

Changes by Legislation Since 1917: The 1919 legislation increases the amount of aid to each county to $100,000 per year and provides that surveys, plans, etc., and construction, shall be supervised by the State Highway Department and that maintenance shall be made by the State Highway Department, the counties providing $100 per mile per year for maintenance; and it is further provided that future aid may be withheld from a county for failure to so provide.

Florida

1917 Procedure: The state rendered financial aid to the counties for the construction of roads and bridges.

The cost of plans, etc. was paid jointly by the state and county, the state paying the salary of the engineer and the county the field and traveling expenses of the engineer and his party.

The cost of construction of roads and bridges was borne equally by the state and county.

State aid roads were selected by the State Road Department, in cooperation with the county boards of supervisors.

Surveys, plans, etc. were prepared by the State Road Department and construction was under the supervision of the State Road Department.

After construction, the roads were maintained under the supervision of the State Department, the cost being equally shared by state and county.

Changes by Legislation Since 1917: There have been no changes in the procedure as outlined for 1917.

Georgia

1917 Procedure: The state rendered convict labor aid and some financial aid to the counties for the construction of roads and bridges.

State convicts were allotted to the counties on the basis of population, and the net motor vehicle revenues collected by the state were allotted to the counties in the ratio that the rural road mileage of each county bore to the total rural road mileage of the state.

The state department exercised no supervision over the surveys, plans, or construction of the roads built with state aid, nor were there any state requirements as to the maintenance of the roads after construction.

Changes by Legislation Since 1917: The 1919 legislation provides for the establishment of a state aid system of inter-county seat roads, to be planned, built and maintained entirely with state funds, and supervised by the State Highway Department. It is provided, however, that counties which build any part of such a system according to state requirements may be reimbursed the whole cost of such construction, and the road improvement taken over and maintained by the state. It is provided that the net motor vehicle revenues shall be part of a fund for the purpose of state aid, and these and other funds are to be allotted annually to the twelve Congressional districts in the ratio of the designated road mileage in each.

Idaho

1917 Procedure: The state rendered financial aid to the counties for the construction of roads and bridges.

The law provided that the right of way for state aid roads should be furnished by the county or district.

Construction costs in counties or districts with assessed valuations of $1,000,000 or more were shared one-third by the state and two-thirds by the county or district. In districts of less than $1,000,000 assessed valuation the costs were shared equally by state and county or district.

It was provided that if state funds were available, the surveys, plans, etc. should be made by the State Highway Department, otherwise by the county or district, but they were always subject to the approval of the state highway engineer and county board. Construction was supervised by a state resident engineer.

Maintenance of accepted roads was executed by the state with state funds except as the state might arrange with a county to perform the work under state supervision.

Changes by Legislation Since 1917: By the 1919 legislation all the duties of the former Highway Department were vested in a Department of Public Works, but the procedure for state aid remains unaltered.

Illinois

1917 Procedure: The state rendered financial aid to the counties for the construction of roads and bridges.

State aid funds were allotted to each county in the ratio that the road and bridge funds of the county bore to the total road and bridge funds of all the counties, providing, however, that in counties where the county road and bridge fund was more than 40% of the amount of the state aid fund the state aid should be 25% of the county road and bridge fund. It was further provided that state aid should cover no more than 50% of the actual cost of construction.

Roads for improvement by state aid were designated by the county boards and the type of the improvement was also selected by the local officials.

Surveys, plans, etc. were prepared by the State Highway Department and construction was carried on under state supervision.

After completion, the maintenance of all state aid roads was executed by the state. It was provided that one-half the cost of maintaining gravel or macadam roads should be paid by the county and the entire cost of maintaining earth roads should be paid by the county. The cost of maintaining all other types of roads was borne by the state.

Changes by Legislation Since 1917: There have been no changes in the procedure as outlined for 1917.

Indiana

1917 Procedure: The state rendered financial aid to the counties for the construction of roads and bridges.

At least 50% of the cost of state aid roads was required to be borne by the county, the balance by the state.

Roads were designated by the county boards and surveys, plans, etc. were made under the supervision of the state highway engineer for two types of construction. The choice between these two types was made by the county board on the basis of the bids, as received for each type.

After construction, maintenance was executed by and at the expense of the State Highway Department.

Changs by Legislation Since 1917: The 1919 legislation repeals the state aid law of 1917 and establishes a highway commission to plan the construction and maintain state roads entirely with state money, but provides that assistance may be rendered by the Highway Commission to the counties in the planning and supervising of county roads, the cost of such assistance to be borne by the county.

Iowa

1917 Procedure: The state rendered financial aid to the counties for the construction of roads. No aid was granted for the construction of bridges or culverts.

The cost of road construction was borne by the state and Federal Government, the counties contributing whatever further amounts it was possible to divert from regular road levies. Aid was granted only for the construction of inter-county roads selected by the State Highway Commission from roads recommended by the county boards of supervisors.

Surveys were made by the county engineers or state engineer, and it was required that the plans be approved by the State Highway Commission, the United States Secretary of Agriculture, and the county board.

Construction was carried on under the immediate supervision of the county egnineer who acted, however, under the direction of the State Highway Commission.

After completion, such roads were maintained by and at the expense of the county in accordance with the orders of and subject to inspection by the State Highway Commission.

Changes by Legislation Since 1917: The 1919 legislation provides for a division of the highways of the state and counties into primary and secondary systems. A fund to be known as the "primary road fund" is created by the combination of existing funds, to be divided among the counties in the ratio that their area bears to the total area of the state. Such funds are to be used for the construction and maintenance of roads of the primary road system. The law provides that the cost of draining and grading and graveling or oiling of primary roads shall be paid wholly from the counties' allotment of the primary road fund. The cost of "hard surfacing" is to be paid to the extent of 75% from the allotment of the "primary road fund," the balance to be paid from county funds raised either by direct assessment on the land along the highway to be improved, or by county bond issue, providing that such issue of bonds shall have been authorized by a vote of the electors of the county, which is also required to authorize the building of a "hard-surfaced" road. Primary roads are to be maintained by the patrol sytem, under the supervision of the county, to the satisfaction of the State Highway Commission, and the cost is to be paid from the "primary road fund," it being provided that if the county fails to maintain the roads to the satisfaction of the commission, such maintenance shall be executed by the commission and the cost thereof charged to the counties' allotment of the "primary road fund."

Kansas

1917 Procedure: The state constitution of Kansas prohibits the state from engaging in any work of internal improvement. No aid, either financial or otherwise, therefore, is granted by the state to its counties.

Changes by Legislation Since 1917: There have been no changes in the procedure as outlined for 1917.

Kentucky

1917 Procedure: The state rendered financial aid to the counties for the construction of roads and bridges.

In the construction of state aid roads and bridges the state paid 75% of the cost in counties, the assessed valuation of which was less than $5,000,000; 70% in counties of an assessed valuation between $5,000,000 and $6,000,000; 65% when the assessed valuation was between $6,000,000 and $8,000,000; 60% in counties of an assessed valuation between $8,000,000 and $12,000,000; 55% when the assessed valuation was between $12,000,000 and $16,000,000; and 50% in counties where the assessed valuation was $16,000,000 or more.

Surveys, plans, etc. for state aid roads were prepared by the State Highway Department.

The construction was carried on under the general supervision of the State Highway Department and the county engineer, and under the immediate supervision of an inspector appointed by the state commission.

After completion, such roads were maintained by and at the expense of the counties, but it was provided that if the county failed to maintain the roads to the satisfaction of the State Highway Department, future aid might be withheld or future apportionments to the county might be used by the state commissioner to effect such maintenance.

Changes by Legislation Since 1917: There have been no changes in the procedure as outlined for 1917.

Louisiana

1917 Procedure: The state rendered financial aid to the counties for the construction of roads and bridges.

Such aid might amount to as much as 50% of the total cost of improvement, and it was further provided that the state might assist the counties by allotment of convict labor or road machinery.

State aid roads were selected by the state highway engineer and surveys, plans, etc. were made by an engineer detailed by the state highway engineer.

(Continued on page 202)

For What Class of Roads and What Type of Construction Should Federal Aid Funds Be Used?*

By THOMAS H MacDONALD

Chief, Bureau of Public Roads, U. S. Department of Agriculture

I wish to revert for a moment to 1916, to the time the federal aid law was passed. At that time the states on the East Coast and those on the West Coast had developed highway departments that had been operating for some years and had reached, in most cases, a high degree of efficiency. But between the mountains there was a large area in which only a few states had developed highway departments that were adequately organized or had sufficient funds at their disposal. The federal aid law made two requirements: First, that the federal aid should be met by the appropriation of at least an equal amount of state funds; and second, that each state should have an adequate highway department.

Those requirements of the federal aid law brought about a condition within one or two years that otherwise would not have been reached in five or ten. State legislatures quickly complied with the federal requirements and, almost over night, it may be said, it was found that every state had provided ample funds to meet the federal aid allowance, and a state highway department, through which to cooperate with the Federal Government. Then ensued the war interval of two years, during which it was impossible to carry forward a great deal of work except on those highways which were essential in the prosecution of the war. In 1917, $2,500,000 of federal aid was paid, but the full effect of the war was not felt until 1918, when the expenditure of federal aid funds was only about $400,000. That year we cut our road work to practically no program at all. Then came the armistice and shortly afterward the federal aid amendment of February, 1919, which placed $200,000,000 for post roads at the disposal of the Secretary of Agriculture, and $9,000,000 for forest road work. Among other things included in that amendment was the removal of certain restrictions which had operated to prevent the submission of many projects which the several states had desired to submit, but which did not have the required post road status. The response to this second amendment was immediate and large—so large that less than a year later, on Dec. 31, 1919, project statements had been approved calling for federal aid to the amount of $110,840,773.50 which is to be spent on more than 2,000 projects of an aggregate length of more than 20,000 mi., the total cost of which will be over $260,000,000.

This chart (indicating) shows in graphic manner the situation which now exists. [This chart is not shown—Ed.] The unfilled, unshaded lines show the amounts which will be available to the states up to July 1, 1920. The total for all the states is $169,750,000. Contrasted with that, the two forms of hatching indicate the amounts of federal aid for which project statements have been approved and agreements executed, respectively. The total federal aid called for in the project statements amounts to nearly $111,000,000; the amount for which actual agreements have been executed is over $55,000,000. To my mind, these two hatched sections show that the state organizations, which were badly crippled during the war by the loss of a large part of their personnel, have "come back." They have "come back" so rapidly that in less than one year they have placed with the Department of Agriculture approved project statements calling for nearly two-thirds of the amount of federal aid which was made available for four years; and they have actually completed agreements on more than half of the projects upon which they have submitted statements. In other words, a program of road work which will call for $55,000,000 of federal aid, and the total estimated cost of which is nearly $130,000,000, is actually ready for the contractor. That is an accomplishment in which the state organizations may justly take pride.

But the most significant relation which this graph brings out is that which exists between the long unshaded lines of available money and the solid lines at the left of the columns which show the amounts of federal money which have been actually paid. None of these lines is very long; some are hardly long enough to be distinguished; all fall woefully short of the lines which represent money available. Their combined lengths would represent, to scale, the sum of $12,234,390.01, the total amount of federal aid money paid up to December 31. I know of nothing which will more strikingly place before you the state of your own business than this diagram. All that difference between the $169,750,000 available and $12,000,000 paid represents funds still to be transferred to the states, and through them to the contractors and the material producers, from the federal treasury.

Consider that this chart represents federal funds only, and that to the $157,000,000 of federal funds, yet to be spent, must be added nearly $250,000,000 of state funds, and there you have a problem in road production—how to translate these unprecedented funds into constructed roads without undue delay on the one hand, and without invasion of the labor supply of other industry, or forcing skyward the prices of labor and materials, on the other.

You have been accenting the development of machinery and the more efficient use of labor. It is supremely important that efforts along these lines be vigorously carried forward. But we must also exercise restraint in throwing work upon the contract market. The larger part of last year's contracts were carried over. I hope that this year, we shall not release so much new work that prices will rise and make, as someone has remarked, a bad contract out of a good contract. In such a policy I hope we may have the cooperation of contractors, and that the states and Federal Government may arrange a program of work that can be absorbed without increasing prices and yielding no increases in production.

We now have a great deal of money available for expenditure. Let us make sure that we spend it in such a way that we shall retain the confidence of the people, so that they will continue to make available the funds which are necessary for the roads which they must have. There is now no disposition on the part of the public at large to curtail the funds available, and there is no disposition to withhold reasonable prices for construction. But after a while the people will begin to question whether they are getting full value for these expenditures; and then this undertaking, which is now started and which we have worked for so long, will be tested in the crucible of public opinion. Let us not, by our own acts, by our own selfishness or indifference or lack of judgment and good sense, jeopardize the favorable sentiment which now exists and which, treated fairly, will supply for our road work all the money we need and more.

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*Paper presented at the 17th annual convention of the American Road Builders' Association, Louisville, Ky., Feb. 9-13, 1920.

Hampered as we are by limitations of material and labor, this next year is going to call for unusual efforts to produce many completed roads of the best quality. So much of our material for the high type roads must be moved over the railroads, that it is disquieting to reflect that some railroad officials have held out no hope for better service after the first of August than we had last year. I see no other solution of this difficulty than that which was proposed some time ago—to make use of the open-top car surplus which usually exists early in the year, before the coal movement starts, to move road material. In advocating this policy, I am embarrassed by the fact that the federal aid law does not allow us to advance estimates on material delivered. This is one of the amendments to the law we shall have to have in order to carry on work more expeditiously under the new condition. We have reached the point—we are not coming to it in the future—we have reached the point now when it is not possible, with plenty of money in our pockets, to go into the market, buy a road and have it delivered over night. I am inclined to think that we will have to provide for the building of roads several years in advance—perhaps let contracts sufficiently extensive to enable contractors to build up organizations and equipment for programs of work ahead of them that will take several years to complete. I see no other way in which we can absorb the money that is available, expend it for the kind of roads for which we should expend it, and be able to cover as many miles as we must needs cover if we are going to render the road service that is demanded by the public of 48 states. We have no longer the condition that, if one state has a big program, the surrounding states do not have, and we can import contractors and material and equipment from our neighbor states. We must develop within each state border, if possible, the labor, materials and contractors to handle the state's program.

In what I have said so far I have referred to the prerequisites of construction. These are money, materials, transportation, labor, contractors, and adequate engineering organizations. I have very briefly referred to certain relations which should exist between them. Perhaps in doing so I have digressed from the subject assigned to me; if so, it is because of the importance which I attribute to these matters as factors in federal aid road production.

In my judgment, the greatest question of future road policies we have before us is that of road classification. The principle is not new. It has been fairly worked out in some of the eastern states, and perhaps in some of the western states, particularly where the lines of travel naturally follow certain well defined lines, but in a large part of the area lying between the eastern and western mountains, classification of roads is very important if we are to proceed with road improvement in an orderly manner.

The majority of our roads, of course, have only a local usefulness, but we can no longer regard all of our roads as of this character. The motor vehicle, by extending the range of practicable travel by highway, some time ago gave to certain of our roads a state-wide significance and to others an interstate or national value. The methods, therefore, by which we shall arrive at a proper classification should now be determined by the cooperation of local, state and national authorities. We must not lose sight of the first function of the highway, which is to develop agricultural resources, but we have to recognize that there are other functions, or other needs for improved roads, which have a bearing on the subject, such as interstate business or pleasure travel and, in certain areas, the military requirement. I am impressed, therefore, that we must superimpose upon the classification which is now generally recognized—which divides all roads into local, county, and state classes—two new classes which we may call, for the lack of better names, interstate or national, and special roads. The national roads would serve interstate business and pleasure travel, and in many cases the military requirements also. The special class would include roads of distinct military significance which mght have little or no commercal value, and certain special recreational roads. In other words, we should have about five classes of roads—the national or interstate roads, special roads, and the state, county and local roads.

The state and local authorities, very generally, have outlined their systems of state, county and local roads; some extensive, others limited; some very definite, others rather indefinite. They have a right to be heard as to the roads which they feel are of the greatest importance to the states. The general staff of the Army and the chief of engineers already have taken up with the department commanders the question of the roads which are of importance from the military standpoint, so that we shall probably have soon, for the first time, a definite expression in regard to the military necessities from the military branch of the Government.

In addition to receiving the recommendations of the state and military officials, I believe we should hear also the representatives of the large national organizations or associations interested in the promotion of touring. We would rather have the people of our Atlantic Coast States go west to spend their vacations than force them to go in the other directions across the water, because of a lack of interstate highways suitable for touring. It is decidedly worth our while to consider this demand, particularly as it happens to coincide very closely with the demand for intercity trucking highways to relieve the congested railroad situation which now exists.

To harmonize the recommendations which will be received from all these sources, and to develop a consistent, well rounded plan, the Bureau of Public Roads, with the expenditure of the federal aid funds at its disposal, stands ready to offer its resources.

The work has already been begun, but we are embarrassed at the outset by the lack of an adequate system of maps covering the entire United States. Our first concern, therefore, has been to have the Geological Survey make up a set of maps for each state for which a basic road map has been developed. These maps will show at least the state and county systems, and on these the sections of the national and special systems can be laid down. From the standpoint of federal aid, to serve the prime importance of developing the agriculture of the country, it does not seem to me that it makes much difference whether a road be built in one direction from a given town or in another. In either direction it is likely to fit into the argricultural needs for improved highways of the territory through which it is built, but if, in addition, it connects with another road or with another part of a main system, then we have served other needs as well as the purely agricultural or local need.

The relation which exists between the expenditure of federal aid funds and road classification, is not a matter of the kind of money. I see no reason to differentiate between the federal dollar and the local dollar, when both are expended upon the roads. But it does seem to me that the federal dollar spells a certain opportunity for harmonizing and proceeding with our road program in an orderly manner that the local dollar does not afford. The local dollar, in some instances, perhaps, is more embarrassed as to the particular road upon which it shall be spent than the federal dollar is.

But, in the main, there should be no great difficulty in arriving at an agreement between the state and federal authorities in regard to the priority to be given to the construction of the various roads. After all, if you select

(Continued on page 203)

GOOD ROADS

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THE STATUS OF STATE AID

Elsewhere in this issue is printed the first installment of a committee report on the "Status of State Aid to Counties, and Its Future Development," that was presented at the annual convention of the American Road Builders' Association at Louisville last February. Those who have followed the development of the state aid principle as applied to road building since its adoption over a quarter of a century ago will find the facts set forth therein very illuminating.

The committee collected very complete data on the methods of operation in the several states, not the least valuable part of the report being the appended portion in which this information is contained.

Perhaps the most striking feature of the report is that part showing the great differences in the way in which the state aid idea is applied in the several states, for, as pointed out by the committee, while state aid is "practically a nation-wide policy, there are wide divergencies between the policies of the states in regard to the manner in which the aid is extended, in the magnitude of the aid, and in the machinery which is provided for the construction and maintenance of the state aided roads."

Several of the other findings which the committee sums up in the early part of the report are also of especial interest. For instance, attention is called to the fact that while five states bear the entire cost of maintaining roads constructed by state aid, there are sixteen which grant substantial aid for the construction of roads, but take no part, financially, in the maintenance of the roads so improved.

Another striking point made is that the state highway departments of seven states exercise only very limited supervision over construction and that the departments of four states that grant financial or convict labor aid for the construction of roads exercise no supervision whatever over the roads built by state aid. In only twenty states, according to the report, do the laws provide for the maintenance of state aid roads under the full supervision of the state highway department.

Equally great differences among the methods of the various states are to be noted in some other phases of the matter, especially in the method of selecting roads for state aid and in the apportionment of state aid funds.

GOOD BRIDGES ON GOOD ROADS

The strength of highway bridges didn't greatly affect the value of the roads a few years ago. As a rule, the loads they were called upon to bear were limited by the pulling power of a couple of horses and when they did fail the loss was not great.

Under present traffic conditions, the utility of a highway depends very largely upon its bridges. The maximum loads that the road will sustain cannot be hauled over it unless the bridges and culverts will safely carry those loads.

That many of the country's roads are limited in their capacity because of weak bridges is well known. It is also true that state highway departments are exerting great efforts to remedy this condition.

Strengthening and reconstructing existing bridges, as well as providing adequate new structures, is of great importance and that importance is increasing every day.

THE NECESSITY OF DELEGATING AUTHORITY ALONG WITH RESPONSIBILITY

There is perhaps no single weakness in organization that has wrecked more administrations than has the failure to accompany delegated responsibility by sufficient authority to make possible the securing of results. This is particularly well illustrated in highway work, in which it is so often necessary to make allowances for local conditions that can be understood by no one so well as by the subordinate on the job.

The road work of a state, and even of many counties, is of too great magnitude to permit of the handling of all of the supervisory work by one man. Most men in responsible executive positions realize, however, that their jobs are one-man jobs; that is, that if they are to get results they must be clothed with adequate authority to carry out the work for which they are held responsible. Not all of them realize that the same principle applies to their subordinates. And officials of that type, even though possessed of technical ability of the highest order, often signally fail in the discharge of their duties.

In order to secure the best results from any organization every man in it must be given sufficient authority to enable him to meet the responsibility delegated to him. In a state highway department, for instance, this should apply to every member of the commission and its staff and to every employee having any degree of responsibility, from the executive head of the department down through the orginaztion to the inspector on a single job or part of a job. Any other plan of organization can result only in confusion, divided responsibility, lack of cooperation, and, finally, failure to get the work done in the best and cheapest way.

The success of any highway department—whether of the nation, a state, a county, or a town—depends not only upon the character and ability of the men in it, but also upon their ability to work together in harmony and with a clear understanding of their individual duties and of the authority and responsibility delegated to them. Character and ability in individuals can be secured by careful selection. Cooperation can be secured only by the proper organization of the department and its administration in accordance with the principle set forth in the foregoing.

Road Building Going Forward

Federal Highway Council's Reports Show No Tendency to Hold Back Road Programs

In spite of the high cost of both material and labor and the fact that in some states it has been found necessary to somewhat alter construction programs to meet existing labor and material conditions, there is no tendency upon the part of the people to slow down the work of highway improvement, according to the Federal Highway Council.

This conclusion, it is stated, is based upon reports reaching the council from various parts of the country. As expressed by the council, these reports indicate that the people "are sold to the heels," on the proposition of constructing highways and that "they are dismissing labor and material problems with curt instructions to their official servants tha' it is up to them to deliver the roads."

Continuing, the council report states:

"A curious fact in connection with construction problems at the present moment, is that the building of roads is seriously hindered by the same evil which they are designed to remove—lack of transportation. According to authoritative information, production is halted to a greater degree by inadequate transportation facilities than by labor shortage. At least this is true, it is claimed, in the production of materials for road building.

"Highway officials—state and county as well as national—are facing their duties with patience and tact, and out of a maze of trying situations, construction is going ahead at a fairly satisfactory rate. But, as Paul D. Sargent, State Highway Engineer of Maine and President of the American Association of Highway Officials, pointed out in a meeting at Philadelphia recently, when the people finally decide to authorize the development of any particular road project, they are prone to expect the work to be done almost over night.

"Another feature in connection with road building at this time is the fact that more and more the educational part of highway development is extending its scope, while at the same time its primal source of activities is being concentrated into a central and more effective organization, directed from the standpoint of the public which represents the builder, the user and the taxpayer. The direction of highway educational work along broad lines, is the result, according to the view taken by many of the highway officials, of the public's determination to get roads built upon a comprehensive scale, economically and with the type best suited to each locality and adapted to traffic needs."

Status of State Aid to Counties and its Future Development

(Continued from page 198)

Construction was carried on under the inspection and supervision of a representative of the State Highway Department and it was required that after completion the roads should be maintained under the supervision of the state highway engineer with state and local funds in the same proportion as for construction.

Changes by Legislation Since 1917: There have been no changes in the procedure as outlined for 1917.

Maine

1917 Procedure: The state rendered financial aid to the towns for the construction of roads and bridges.

The extent of the aid furnished by the state varied from the equal of the contribution of the local government to 2⅔ times the local contribution, depending on and varying inversely with the assessed valuation of the town.

Surveys, plans, etc. were made under the supervision of the State Highway Commission and construction was carried on under state supervision.

After completion, the roads were maintained by and at the expense of the State Highway Commission, the board of selectmen of the towns contributing not over $30 per mile per year.

Changes by Legislation Since 1917: There have been no material changes in the procedure as outlined for 1917 .

(To be Continued)

National Highway Act Will Not Encroach on State Highway Departments

Senator Townsend Says Measure Will Not Supersede Federal Aid Plan—Federal Highway Council Urges Passage of Bill

Attempting to create the impression that the National Highway Act proposes to take over all highway work as a federal function and that federal aid as now operating will be jeopardized, a few highway officials in some states are expressing opposition to the measure, according to the Federal Highway Council.

The National Highway Act, which is now in the hands of the Senate Committee on Post Offices and Post Roads, provides for the creation of a Federal Highway Commission to take over from the Department of Agriculture the highway work now being done as a branch of that department. The creation of a new department to administer the highway affairs of the United States is necessary, it is claimed, because of the growing demand for transportation facilities. The movement to satisfy this demand, as expressed in the proposed National Highway Act, has been endorsed widely by civic and commercial organizations throughout the country.

In order to combat these unfounded statements, Senator Townsend, author of the measure, has pointed out that the National Highway Act does not propose to supersede he federal aid plan, but, in fact, seeks to extend that plan and help states by taking over as a federal burden the construction and maintenance of such routes in each state as may be designated as links in the national system of highways. The mileage of national routes in each state will approximate about 1% of the state mileage, so that the claim, continues Senator Townsend, that the work of the state highway departments will be encroached upon is unfounded.

"There are certain highways which must be national in character," an officer of a prominent state chamber of commerce wrote the Federal Highway Council recently during the period of a threatened railroad strike. "The need of a network of national highways may be forced upon us by the imminence of a nation-wide railroad strike. In England the situation was saved by the use of motor cars. We could not save the situation in this country in like manner at certain seasons of the year because of the lack of highways. If, however, there was such a network of highways extending between the principal cities, every motor vehicle in the country could be requisitioned in such a crisis and the people fed and kept warm."

The writer of this statement is in a state where many millions of dollars have been spent in highway development and where the necessity is seen for a national system of highways to unite the states and form the backbone of a definite system of state and county highways. To achieve this end, backers of comprehensive highway work are insistent, reports the Federal Highway Council, in their position that it will be necessary to take the Bureau of Public Roads out of a department where it is one of 16 bureaus and, because of the importance and responsibility of this bureau in spending millions of dollars, place it in a separate body whose sole duty will be the full development of the public highways as one of the nation's greatest assets.

For What Class of Roads and What Type of Construction Should Federal Aid Funds be Used?

(Continued from page 200)

the roads of greatest economic need in the states, the chances are that you will be selecting those, which, in general, should be parts of a national system. That is not altogether true. There are special cases in the western country where it is not true, but in those cases there is another remedy which should be applied. This brings up a subject which is somewhat aside from my topic, but I am particularly reminded of it because of the presence in Washington, during the past week, of representatives of seven or eight of the large western states in which there are large holdings of public lands. It is probable that these lands in large part will be owned by the Federal Government indefinitely. To require a state in which, let us say, the title to 90% of its entire area still reposes with the Federal Government, to meet its full apportionment of federal aid on a 50-50 basis certainly places an unusual and unwarrantable burden on that state. The states in which a condition of this sort obtains are asking relief. The Louisville convention of the American Association of State Highway Officials passed a resolution recommending that relief be granted in proportion to the holdings of the Federal Government in the several states, and I heartily concur in that resolution.

I hope that the eastern states, which I will say frankly are helping to build those roads out there, will adopt a big brotherly attitude by agreeing to the extension of this help where help is needed. In return for such an attitude on the part of the eastern states, I think it is only fair that the additional aid should be devoted to the building of those main lines of road which connect the eastern routes and Mississippi Valley with the western coast lines.

There is another situation which is somewhat puzzling to us. Some roads which should be built as connecting links at this time cannot be built immediately because the states in which they are located do not regard them as of the first importance. It seems to me that we must encourage the immediate building of such roads by the payment of more than 50% of the cost from federal funds.

The Secretary of Agriculture announced a few days ago that he intended to retain and enlarge the Advisory Committee of State Highway Officials for the purpose of correlating a system which should be given precedence in the expenditure of federal aid funds. I assume that such a system will include the main roads of all the states; but frankly, I do not know what percentages of the roads of each state will be included.

Referring very briefly to the type of construction for which federal aid funds should be spent, I may say that the types for which allotments have been made up to the end of 1919 and the mileages of each type are as shown in the accompanying table.

It is true that the earth, sand-clay and gravel types have been built in much larger mileage than the other types. On the other hand, there is more federal money allotted for one of the permanent types than for all the earth, sand-clay and gravel roads, so that while the mileage of these is large, the allotment of money for them is not large in proportion.

TABLE SHOWING MILEAGGES OF VARIOUS TYPES OF ROADS FOR WHICH FEDERAL ALLOTMENTS WERE MADE TO DEC. 31, 1919

Type	Miles
Earth roads	1,790
Sand-clay	721
Gravel	1,740
Macadam	234
Macadam, mat top	185
Bituminous macadam	142
Bituminous concrete	127
Concrete	643
Brick	120
Miscellaneous	49

It seems to me that we are coming to the time when the types of roads which we shall have to build are either the low cost types, such as earth, sand-clay and gravel, constructed with surfacing material available locally in those districts where the primary or pioneering road work is yet to be done, or that we must turn to the standard paving types for roads in districts where we are already reconstructing our highways and where the population is such that the traffic is too heavy for the low-cost types, and where that traffic is constantly increasing in weight and in numbers. I believe that most of the road builders here will agree that expenditure of money is justified, first, for location; second, for alignment; third, for gradients; fourth, for the purpose of obtaining ample width and ample drainage; and fifth, for the elimination of railroad crossings. I believe that these are fundamentals for which everyone will agree it is perfectly proper that money be expended. On the cheaper types of road, the expenditure is made, largely, for these purposes. Where we have sand-clay or gravel available locally, it is possible, through the use of loading machinery, to surface the roads without great additional cost, and to obtain much service out of them under light traffic which now exists in many of the districts. Such types may well be used, also, on new heavy traffic main roads during the time the grade is settling. But on those roads where the grades have existed for some time, where traffic has compacted the soil, where it is not a question of regrading, realignment, and new locations—on those roads, I believe, we should go to the standard types of paving. I think, perhaps, "standard type of paving" is a safe term to use. But it seems to me that in the production of roads, which is going to be the serious problem this year, federal aid funds should be expended, either for the low cost types in the building of which machinery is used practically altogether, or for the higher cost roads, for which machinery, if not already developed, is rapidly being developed. In these two extremes we have the purposes to which we should devote the federal aid funds. I feel that we should avoid further experiments with the in-between types, and I believe, that in the future, we shall come more and more to the use of federal aid funds for the standard heavier types of paving.

———OOO———

The Continuation of Federal Aid to the States in helping them to build up a connected system of highways throughout the country is favored by Edwin T. Meredith, the newly appointed Secretary of Agriculture. "As the year 1921 is the last covered by the law," Secretary Meredith says, "it would be highly desirable, in my opinion, for Congress to make provision as promptly as possible for the continuation of the work under the present system by an appropriation of at least $100,000,000 for each of the fiscal years beginning with 1922."

MEETINGS

Calendar of Coming Meetings

Apr. 12-17—United States Good Roads Association—Eighth Annual Convention, Hot Springs, Ark. Director General, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

Apr. 16-17—Bankhead National Highway Association—Fourth Annual Convention, Hot Springs, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Bldg., Birmingham, Ala.

May 10-11—American Association of Engineers.—Annual meeting, St. Louis, Mo. Secretary, A. H. Krom, 63 E. Adams St., Chicago, Ill.

May 13-15—League of Texas Municipalities.—Eighth annual convention, Dallas, Texas. Secretary, Frank M. Stewart, University of Texas, Austin, Texas.

National Highway Traffic Association

The North Central Division of the National Highway Traffic Association will hold a public meeting at the Chamber of Commerce, of Detroit, Mich., on Thursday, April 15.

George W. Walters, Deputy Commissioner of the Detroit Police Department, will speak on "One-way and Segregated Traffic Streets." The discussion will be opened by Glen Phillips of the Detroit City Planning Commission. Horatio S. Earle, of Detroit, will speak on "Pavements Required for Economic Highway Transport," and discussion on the subject will be opened by Arthur H. Blanchard, President of the National Highway Traffic Association and Professor in charge of Highway Engineering and Highway Transport at the University of Michigan.

PERSONAL MENTION

George H. Herrold was recently appointed managing director and engineer of the City Planning Board of St. Paul, Minn.

C. P. Prann, formerly Assistant City Engineer of New Haven, Conn., was recently appointed city engineer of Meriden, Conn.

C. I. Burgraff, formerly with the Illinois State Highway Department, is now with the Morgan Engineering Co., as bridge engineer.

C. F. Lewis, formerly with the U. S. Bureau of Public Roads, has formed the firm of Spoon & Lewis, consulting engineers, in Greenboro, N. C.

M. Jones, formerly City Engineer of Port Arthur, Ontario, Canada, is now in charge of all the work in Toronto of the Warren Bituminous Paving Co.

G. R. Winslow, formerly first assistant engineer of the California State Highway Commission, was recently appointed engineer of Division No. 3.

E. S. Rife has resigned as county foreman of bridges of Benton County, Iowa, and will engage in contracting with A. Melberg, former County Engineer.

E. H. Baker, of Buffalo, N. Y., has been appointed to the Federal Highway Council. Mr. Baker is president of the Buffalo Automobile Dealers' Association.

C. N. Reitze, formerly district engineer of the Seattle office of the Portland Cement Association, was recently appointed district manager of the Pacific Coast offices of the association at Seattle, Portland, San Francisco and Los Angeles. Prior to entering the employ of the association in 1916, Mr. Reitze was general manager of Reitze, Storey & Duffy, general engineers, Seattle.

G. E. Warren has resigned his position as assistant manager of the service bureau of the Universal Portland Cement Co., of Chicago, Ill., and will continue his duties as manager of the American Concrete Pipe Association. Mr. Warren has been connected with the Universal Portland Cement Co., for five years and during the past year he acted also as secretary-treasurer of the American Concrete Pipe Association.

OBITUARY

F. J. Bastable, Assistant Superintendent of Public Works of Rochester, N. Y., died recently at his home in that city.

William S. Beattie, City Engineer of Charles City, Iowa, died in that city at the age of 32, following an attack of influenza.

I. M. Atkinson, formerly Assistant Division Engineer of the California State Highway Commission, died recently at his home in San Francisco.

Thomas P. Strack, at one time with the Ohio State Highway Commission and more recently a general contractor, died recently at his home in Cincinnati. Among the large municipal contracts that Mr. Strack handled was the building of the Ludlow Avenue Viaduct in Cincinnati.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUG. 24, 1912, OF "GOOD ROADS," published weekly at New York, N. Y., for Apr. 1, 1920.

State of New York, County of New York, ss:

Before me, a Commissioner of Deeds in and for the state and county aforesaid, personally appeared E. L. Powers, who having been duly sworn according to law, deposes and says that he is the Editor and Business Manager of "Good Roads," and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation,) etc., of the aforesaid publication for the date shown in the above caption, required by the act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse side of this form to wit:

1. That the names and addresses of the publisher, editor, managing editor and business managers are:

Publisher—The E. L. Powers Co. (Inc.), 150 Nassau Street, New York, N. Y.
Editor—E. L. Powers, 150 Nassau Street, New York, N. Y.
Managing Editor—T. A. Hulbert, 150 Nassau Street, New York, N. Y.
Business Manager—E. L. Powers, 150 Nassau Street, New York, N. Y.

2. That the owners are:

The E. L. Powers Co., (Inc), 150 Nassau Street, New York, N. Y.
E. L. Powers, President, 150 Nassau Street, New York, N. Y.
C. J. O'Brien, Treasurer, 150 Nassau Street, New York, N. Y.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent. or more of total amount of bonds, mortgages, or other securities are: None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct of indirect in the said stock. bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is: (This information is required from daily publications only.)

E. L. POWERS, Editor & Bus. Mgr.

Sworn to and subscribed before me this 1st day of April, 1920.

(Seal)
O. D. CONKLIN,
Commissioner of Deeds, N. Y. C.
(My commission expires May 21, 1920.)

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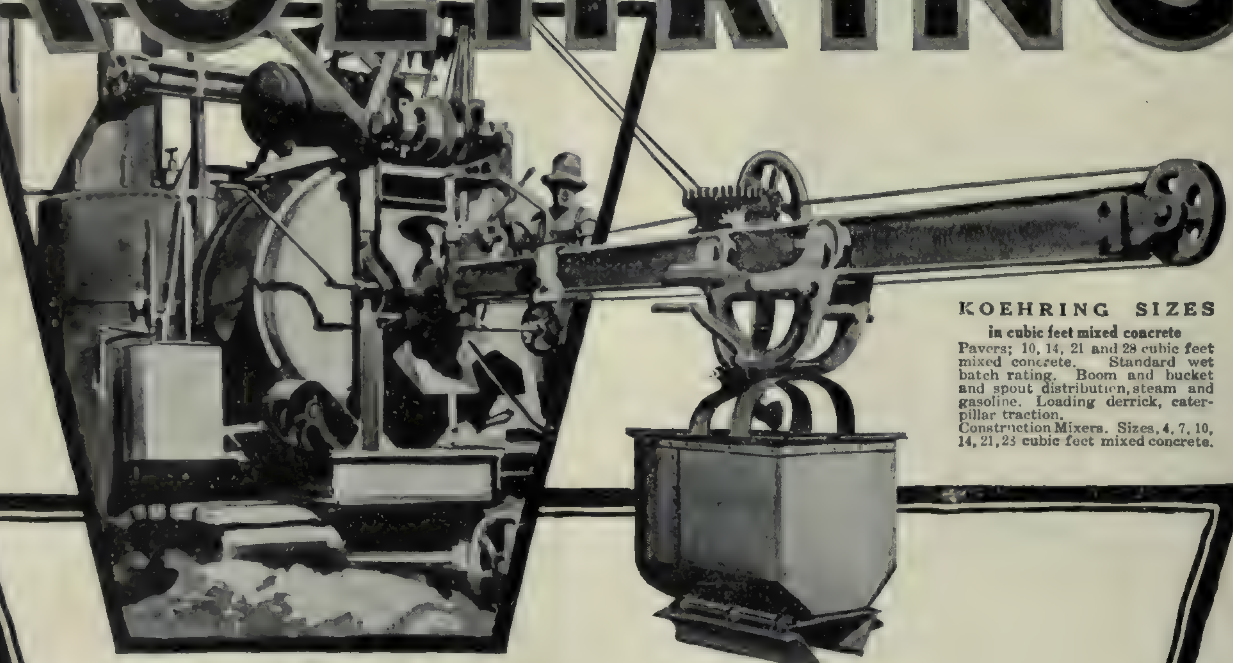

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Old Series, Vol. LVIII
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JAMESTOWN, N. Y., APRIL 21, 1920

Number
16

Cooperation between Engineers and Contractors in the Execution of Highway Programs[*]

By CHAS. M. UPHAM
Chief Engineer, Delaware State Highway Department

To begin with, we want to be very frank with each other. Most of the faces here are absolutely familiar, so I think we can say things just as we see them and as we mean them. I am going to condense the analysis from my point of view down to a very few sentences, and I think that if we can remember these six points, as I will call them, you will agree with me that there will be a complete cooperation between contractors and engineers, and as one man put it the other day, the millennium will be in sight.

Some time ago I attended a banquet in New York; there were about eight or ten speakers and they all got up and talked on various things, but one man said that he was going to mention just one thing and just one point, and he did that to emphasize it; he talked on nothing else. I did not realize it at the time, but that was possibly ten or twelve or fifteen years ago, and I recall exactly the man that mentioned this point and also the exact point itself. I do not even remember who the other speakers were. That is the reason I am going to try to condense this subject of cooperation between contractors and engineers down to six points. Of course, we must assume that both sides are absolutely honest; that their purposes must be honest and that they follow those purposes honestly. I think many of the misunderstandings that have grown out of the relations between contractors and engineers are due to abuse both on the contractors' side and on the engineers' side. I do not think that either one is at fault, but I think that both are at fault. And, assuming this condition, what we want to do is to remedy it as soon as possible. I am going to read the six points as I have analyzed them, and then we will amplify them slightly.

The requirements on the part of the engineer are: First, there shall be substantial administration and common sense engineering; second, the engineer must require things within reason and draw his specifications in a clear, definite manner; third, the engineer should furnish competent and experienced inspection. Now those are the only three points on the part of the engineer, and a person can discuss this, and it will come right back to those three points—common sense and substantial engineering; reasonable and definite specifications; competent and experienced inspection. Now, as contractors, can you think of any further requirement that will bring about a complete cooperation or satisfactory relations between the engineers and contractors?

On the part of the contractors, there are three points which seem to be absolutely necessary, and the first of those points is sufficient and satisfactory equipment—we all concede that this is necessary. The second point is adequate funds—I think a good many differences between contractors and engineers have arisen from the fact that the contractor has not had the liquid finances to turn out the job. And the third point is competent and efficient personnel of organization. Now I think you can also discuss the points from a contractor's point of view, and you will come right back to one of those three points.

Now I am going to mention a few instances just to make these points a little clearer, and am going to dwell on facts, either as I have found them or as they have been handed to me. I will talk about the contractors first, and if you think I am too hard on the contractors, just wait until I get through with the engineers and I think you will be satisfied. One reason why there has been a little better cooperation recently between engineers and contractors is because many of the present day contractors were former engineers, and they have seen the game from both sides. That does not mean that they are any better qualified as contractors, but simply that they know the requirements of the engineers, or they have been trained from that side so they can anticipate any conditions. I was on a job a short time ago, when an engineer told me that he was having a great deal of trouble with his contractor. I asked "In what manner?" (I try to choose my words in this because I do not want to say the wrong thing.) He stated that the greatest trouble he had with the contractor was that of every inspector or every engineer that they sent out, the contractor would ask: "What salary do you get?"

The man would tell him and the contractor would say:

"Why, I am very much surprised that a man of your caliber should not get more money than that."

He would not come right out openly and offer the man money, but he would say:

"You deserve more money; I wish I could get a man like you for anywhere near what the state is paying you. What if I offered you a position? Could you accept a position with me? I could pay you just double what you are getting now."

---

[*] Paper presented at the 17th annual convention of the American Road Builders' Association, Louisville, Ky. Feb. 9-13, 1920.

The inspector would swell up and begin to feel that he was being done an injustice, and he would go home and think about it and wonder why he should be required to work for what he was working for. He is a capable man and, therefore, he should demand more money. He would go back to the contractor and say:

"I have decided to accept your offer."

The contractor would say: "All right. Of course it would be impossible to take you on right now but after this job is over, we will make our arrangements."

That inspector, of course, anticipated going to work for this contractor just as soon as the job was over and they became very friendly and the work may have suffered. When the job was over, the contractor would say:

"Well, I haven't a position open for you now, but I am going to keep you in mind. I will put your name right down in my book and I will keep you in mind."

That inspector is probably still working for the state at a salary no better than he was getting in the first place. Now that is just one little instance; I am not accusing anybody but it is an actual fact.

Here is another instance that is a little cruder. (I am very glad to say that none of these things that I am mentioning are of recent date; they happened before the war, every one of them.) An inspector would go to work early in the morning, and as it was rather chilly he would wear his coat. As the sun got higher he would take off his coat and hang it on a tree. When he would go to take up his coat at night, he would find a $20 bill in the pocket of his coat. The first day he wondered how it got there, but thought that possibly he had $20 that he had not accounted for, and did not think anything more about it. The next day the same thing happened, and the next day the same thing happened again, so he began to get very suspicious of his coat and hung it in a position where he could watch it. After a little while the contractor's foreman went to the coat and he saw him fooling with it. The inspector went to the coat later on in the day, and there he found the usual $20 bill. He then immediately knew where it came from, and he was very much perturbed as he happened to be a very honest inspector. He went to his chief engineer and asked him what he should do. The chief engineer who was very diplomatic, as I think, told him to do nothing at all, but as the money was received to turn it over to the chief engineer. That was only for the purpose of keeping the money temporarily. The job was finished and it was found that the inspector had carried on his work in an honest way, that there were no short-cuts or anything. He was a little more strict than usual on the carrying out of the specifications, and the job was finally wound up and the final estimates prepared. At the time the conractor called at the office for the final estimate, he was handed an additional velope. The chief engineer said:

"That is the $260 that you have been putting in the coat of the inspector. He is returning it to you."

I do not know whether that contractor is still in business or not; I do not imagine he is.

One other little instance happened, which is a very trivial instance. A very promising inspector, with new ideas, happened to be inspecting on a contract on which the contractor had old ideas. He mentioned the fact that certain things were in the specifications, but that of cousre he would not be required to carry them out. However, he was obliged to carry them out and a great difference arose between the contractor and the inspector. This inspector, as I said, was very promising, and the next year he was made resident engineer, and it so happened he had the same contractor on another job. The contractor asked to have this man removed, for no legitimate reason, but simply because he felt that the man was down on him. When asked to give any proof that the man was down on him, he could not, and so the resident engineer was not removed. So other tactics were followed. The grading was going on, and one morning the chief engineer was called up and the contractor stated that he had to move about 1,000 yd. of material on account of the grades being wrong. An investigation followed, and it was found that the grades were wrong. When looking up the field books, however, everything checked and they could not find where there was any error, only the rod readings on the stakes. In two or three days the contractor called up again and registered an objection because he was obliged to spend a large amount of money due to an error in alignment, an error on the part of the engineer. It so happened that in an investigation, they could not see where the trouble was—it was one of those mysterious mistakes. Two or three times later there were errors in grades. A procedure was then followed by the resident engineer before the contractor happened to catch on. The same stakes were used for the final or subgrading or form setting as were used for the rough grading. The same thing happened; the contractor called up about the errors in grades. The final grading had been done and when they got ready to set the forms for the concrete roadway, they found that the subgrade had to be changed all over again. Upon investigation it was found out from a foreman who had become estranged from the contractor in the meantime, that he was asked each night to go over the job and re-drive all the stakes, take a sledge hammer, knock some down 2 or 3 in., pull some up, and do things of that nature. That is one other point that is not substantial.

Here is one other instance: A contractor was constructing a road through a rural section and he was obliged to use a large amount of local labor. This local labor had never seen a concrete road before, and they did not know anything about it, other than to do exactly as they were told. The contractor was a very witty man and he would go on the job each morning, go around by the mixer and say:

"Boys, you live right here in this locality. I want to see you get a good road and I know you want to get a good road, so fill up those stone barrows and put in all the stone you possibly can."

When the inspector would arrive, they would be piling up the stone barrows.

Now, I do not think I have anything further, or worse, on the contractors, so I am going to let that go and we will get after the engineers for a few moments.

I know some very substantial contractors who bid on work, and they were low bidders. They were foreign contractors, or contractors located probably a thousand miles from the work. They expected to have the work awarded to them and they went to the place where the award was to be made and sat out in the lobby and waited for the contract to be awarded. The first day there was no award. The second day there was no award, and the contractor was sitting out in the lobby when a man from the commissioner's room came out and said:

"You are the low contractor?"

"Yes."

"Well, the commissioners are now ready to do business; it will take $3,000 to do business."

In this particular case, I am sorry to say, the contractor did business; and he is still doing business there. Of course that is no reflection on the contractor, so far as I can see—or not as much as on the engineers and commissioners.

It is said that we should have definite specifications. I recall a conference which I attended at one time, in which they were drawing specifications, and one of the remarks that I can remember, which was made by one of the foremost highway engineers, was:

"Why, let's put the clause in; possibly the contractors will not see it."

Now I have no doubt but that that clause led to misunderstandings, loss of money, and possibly the bankruptcy of contractors.

And right in this connection, a few years ago I understand that Delaware and Upham were boycotted as far as contractors went, and that we could not get any contractors to bid in Delaware. I heard that from several sources, both from contractors and engineers. The reason for it was that we were too strict. Now I will tell you what that strictness consisted of: We cut out everything in the specifications that we did not require a contractor to do, but we left in the things we did want done, and then we required the contractor to do them. When the contractor was making up his bid, time and again every one of our engineers was instructed to have the contractor read and re-read the specifications and see what he could do the work for and then bid on what he could do the work for. That was the reason that Delaware was once boycotted. It was soon found out, though, by contractors that we were treating every contractor the same; that all a contractor had to do was to read what was in the specifications, figure what he could do the work for and then come down there and bid. Many contractors did that. They came and, with but a single exception, every contractor that has, up to date, finished work in Delaware, has come back and bid on more work, and today we have some contractors waiting for us to bring out work. Now I base that on the very fact that our specifications are definite, our inspectors are just as good as we can obtain, and we try to have reasonable and fair engineering.

One other point: In the conferences at which we draw our specifications we appoint either one or two men to represent the contractor's side in all discussions. I think that is a point well taken. In other words, when a discussion takes place, they are not all on the side of the engineers; there are two that are on the side of the contractors and discuss the point from that side. One of them has been in the contracting business and was superintendent for a contractor; the other was an engineer.

In one particular instance, I know of a contractor bidding on two pieces of work that were identical. The conditions, as nearly as we could determine, were identical, but still the contractor bid $15,000 more on one job than he did on the other. When asked why he did it he said it was because he had such and such a man as an engineer on that particular contract.

One other point in regard to definite sepcifications is that, so far as possible, detailed procedures should be mentioned. And one other very important point is the method of payment, as to whether or not excavation should be paid for in relaying pipe, or whether the labor, the pipe excavation and everything should be considered in the unit cost.

Now, to come to the third point on the engineering side, the inspectors. Many people have got high priced, experienced engineers and they have made every possible effort to have good specifications, but when it came to the inspector, who is absolutely the most important man on the entire job, they would have some inexperienced man or some man just out of college. I think it is beginning to be realized that the inspector should be one of the very best men in the entire organization, and as soon as that is realized a great step forward in the relation of the contractor and the engineer will have been taken.

Just as a matter of interest, I recall a short time ago—some four or five years—an instance of inspectors for a state on a brick job having spasmodic fits of culling brick. They would arrive on the job on Saturday morning and throw out possibly every other brick, or throw out two bricks for one good one. Saturday noon, for some reason, they would relax into a coma and not cull any bricks; in fact, the contractor would go back and use probably 90% of the brick that they culled during the morning. I could not exactly fathom this until about two years later when this same contractor was bidding on a job a little further south and asked that our bureau, which was then the Du Pont Inspection Bureau, look over his bid and assist him in bidding. I visited the city, went over the work, and asked him for his notes on the work. He handed me a lot of papers, and he also handed me a little vest pocket book, and said:

"You will find all the notes in there; I don't know where they are, but they are in there."

So I started to look through the book—it seemed to be an old scratch book but some of the dates were mentioned when this particular brick job was taking place, and as I glanced down through it I saw an inspector's name. I said, "That sounds natural," and right under the name there was a date, and on the right hand side, there was "$15." Under that one week later there was $15, and under that "$15." And it went on for ten or twelve items. Right on the next page there was the name of another inspector who happened to be on that job—and he was a $10 man. I went through the book and there was a little item here of $5 and there of $10. I was rather slow, and being a man of one thought, I did not deduce immediately what it was, but as I thought the thing over, I rather suspected the contractor who, as I thought—and recently learned—is absolutely honest. This contractor and I met a little later on, and I took a chance shot and said:

"Why did you pay those inspectors money on that job? There was abolutely no necessity for it, the job stood on its own foundations. It was an honest job and it has been proven by the fact that the job is still there now, in excellent condition. Why did you give these men money?"

He looked at me, wondered how much I knew, and asked me how I found out. I said:

"I saw it in your notebook, I couldn't help but read it, it was there."

"Well Charlie," he said, "what are you doing to do? The inspector came to me every Saturday morning and asked, 'Will you loan me $15?'"

The contractor knew at the time that he was never going to get that $15 back, and it was just a weekly occurrence. These inspectors would go to that contractor and ask for a loan of $10 or $15. That is one little instance that is just interesting. Now this contractor was absolutely honest and without any such thing as that he would never think of giving money to an inspector. That I am holding up against the engineering side, simply because they were not competent inspectors.

Now one other little point: An inspector must absolutely know the difference between the essentials and non-essentials on a contract—if there may be termed essentials and non-essentials. But the one point that he must watch is to keep the contract going, if possible. I recall going on a job at one time when an inspector, because of a clause in the specification, insisted on requiring the contractor to pass all his cement through a 200-mesh sieve. I imagine that would hold up the progress slightly when they were using a carload a day.

One other little instance which may be interesting—this is on the contractor: The inspector was rather green and he was not well informed. He said:

"What does this 1:2:4 concrete mean anyhow?"

The contractor said, "Why, that is one shovel of cement

(Concluded on page 212)

Status of State Aid to Counties, and Its Future Development-II[*]

(Continued from April 14)

Maryland

1917 Procedure: The state rendered financial aid to the counties for the construction of roads and bridges.

Surveys for state aid roads were made by the State Roads Commission at the request of the counties, the counties providing not more than $50 per mile to pay the cost of such surveys.

Construction costs were paid 50% by the state and 50% by the county, but it was provided that the owners of property butting on the road should pay 1-5 of the county's share.

Surveys, plans, etc. were made by the State Roads Commission and construction was carried on under the supervision of a resident engineer of the commission.

Maintenance was by and at the expense of the state, which represented a change from the procedure followed prior to 1916, under which such roads were maintained by the county at county expense under state supervision.

Changes by Legislation Since 1917: There have been no changes in the procedure as outlined for 1917.

Massachusetts

1917 Procedure: The state rendered financial aid to the counties and towns for the construction of roads and bridges.

It was provided that the state should pay the entire cost of construction, but that the counties or towns should repay within six years 25% of the cost, with interest at 3%.

Surveys, plans, etc. were made by the State Highway Commission and the construction was carried on under state supervision.

Roads constructed with state aid were of two classes designated respectively as "state highways' and "small town roads."

The maintenance of state highways was executed by the state but the towns were required to repay an amount varying from $50 to $500 per mile, dependent upon the assessed valuation of the town. "Small town roads" were maintained by the towns but it was provided that in case of failure by the town to maintain such roads to the satisfaction of the state commission, the state might perform the work and charge the town an amount varying from $50 to $200 per mile, dependent upon the assessed valuation of the town.

Changes by Legislation since 1917: No changes affecting state aid procedure have been made since 1917.

Michigan

1917 Procedure: The state rendered financial aid to the counties and towns for the construction of roads and bridges.

Roads of three classes received state aid. Those of the first class, known as "state reward roads," were constructed by the counties, the county being granted a reward, the amount of which varied from $250 to $1,700 per mile, according to the type and width of the road. Roads known as "state aid roads" were constructed with state aid which varied from 50% to 75%, according to the assessed valuation of the town or county; and roads of the third class, known as "trunk line roads,' were constructed with joint state and county funds, the amount of the local funds varying according to agreement. "State reward" and "state aid" roads were selected by the county or town. The "trunk line highways" were designated by the State Highway Department.

Surveys, plans, etc., for all three types were furnished by the State Highway Department.

"State reward roads" were built by county or town. "State aid roads" and "trunk line roads" were built under the supervision of the State Highway Department. On "state reward roads" it was provided that the bridges of more than 30 ft. span would be built by the state when the expenditure by the local government for the road and structures, not including the state rewards, equalled the cost of the bridge plus the state reward.

On "reward roads" the maintenance was executed by the local authorities, but it was provided that future rewards might be withheld by the state to compel proper maintenance. Maintenance of "state aid" and "trunk line" roads was carried out by local boards of the towns or counties, subject to state supervision.

Changes by Legislation since 1917: The 1919 legislation increased the state rewards to 25% of the cost of the roads but not to exceed $3,000 to $7,500 per mile, according to the type of road. Rewards on roads which are a part of the trunk line system were increased to 50% of the cost, not exceeding, however, $15,000 per mile. The county's share of trunk line construction cost is fixed at from 5% to 25%, according to the assessed valuation of the county or town per mile of trunk line road in the county or town. Counties, road districts, etc. are required to establish a patrol system of maintenance in a form satisfactory to the state highway commissioner or lose future state rewards. The maintenance rewards in the amounts of 6% of the total state rewards previously paid, but not exceeding $100 per mile, are granted to counties, towns, road districts, etc.

Minnesota

1917 Procedure: The state rendered financial aid to counties for the construction of roads and bridges.

State aid rods were constructed under county adminisiration with state and county funds, the contribution of the state varying from 50% to 80% of the cost of construction, according to the assessed valuation of the county. It was provided that the towns might assist the counties in the payment of construction costs and receive a proportionate share of the state aid.

Surveys, plans, etc. were made by a state assistant engineer, detailed to the county, and the construction was under the supervision of this assistant engineer.

After completion, state aid roads were maintained by the counties, with state and county funds, in the ratio of the division of the construction cost. Upon failure by the counties to satisfactorily maintain the roads it was provided that the state might act and defray the cost from the state reserve maintenance fund, later reimbursing this fund by deductions made from future allotments to the counties.

Changes by Legislation since 1917: A constitutional amendment, shortly to be voted on, provides for a system of trunk highways to be located, designed, constructed, and maintained entirely by the state, in addition to state aid roads otherwise provided for.

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[*] Committee report presented at the 17th annual convention of the American Road Builders' Association, Louisville, Ky., Feb. 9-13, 1920.

Committee: T. Warren Allen, General Inspector, Bureau of Public Roads, U. S. Department of Agriculture, Chairman; W. R. Neel, Chief Engineer, Georgia State Highway Department; R. L. Saunders, Deputy State Highway Commissioner of Connecticut; Ira R. Browning, State Road Engineer of Utah; A. W. Graham, State Highway Engineer of Missouri; M. W. Watson, State Highway Engineer of Kansas.

Mississippi

1917 Procedure: The state rendered only advisory aid to the counties in the construction of roads and bridges. The law provided that the State Highway Department might assist the counties with its advice in matters of construction and in securing competent county engineers and that the state department might make surveys and prepare plans to be furnished to the county authorities free of charge.

It was provided that all plans for road construction prepared by county engineers must be submitted to the State Highway Department for approval, but the state department exercised no supervision over the construction or maintenance of such roads.

Changes by Legislation since 1917: There have been no changes in the procedure as outlined for 1917.

Missouri

1917 Procedure: The state rendered financial aid to the counties for the construction of roads and bridges.

The construction cost of state aid roads was paid in the first instance by the county, but 50% of the cost was refunded by the state upon completion and acceptance of the road.

Surveys, plans, etc. were made by the county and submitted to the State Highway Department for approval.

The construction was carried on under the supervision of the state highway engineer and it was required that the road should be accepted by him before final payment.

State aid roads were maintained by the counties, with county funds. The state highway engineer was required to inspect them at frequent intervals and compel satisfactory maintenance. The amount of $15 per mile per year was allotted to the counties for the maintenance of intercounty seat highways.

Changes by Legislation since 1917: The 1919 legislation provides for a system of 6,000 mi. of state roads, to be designated by the state highway engineer. The mileage in each county is to be in the ratio of the area of the county and mileage of county roads.

Surveys are to be made immediately by the state highway engineer and a map of the system is to be prepared by him. Detailed plans are not to be made until a time immediately in advance of construction.

The law provides that the state is to pay not more than $1,200 per mile to survey, plan, clear, grade, and drain the roads of the state system. If a county requests a better road than is provided for under the law and will guarantee to pay one-half of the cost of constructing such a road in excess of $1,200 per mile, the road may be built and the other half of the excess cost paid from federal aid funds. If any part of the designated system is constructed according to state requirements by a county at county expense, the state is to give cedit for a reasonable part of the cost thereof not exceeding $1,200 per mile.

In general the construction is to be supervised by the state highway engineer.

Maintenance is to be executed by the counties under state direction and the state is to refund one-half of the cost of such maintenance. The amount allotted for the maintenance of intercounty seat highways is increased from $15 to $25 per mile per year.

Montana

1917 Procedure: The state rendered financial aid to the counties for the construction of roads and bridges, but the law provided no definite procedure for the planning, construction, and maintenance of state aid roads and prescribed no fixed scheme for the division of the cost.

Changes by Legislation since 1917: There have been no changes in state aid legislation since 1917.

Nebraska

1917 Procedure: The state rendered financial aid to the counties for the construction of roads and bridges.

The proportions of the cost of construction of state aid roads to be borne by the state and county, respectively, were not definitely fixed. It was definitely provided, however, that the state should pay one-half of the cost of constructing bridges of a length of 175 ft. or more.

Upon request of the county, the state rendered assistance in the making of surveys and the preparation of plans, and the construction of state aid roads was carried on under the supervision of the state board. All plans for bridges costing more than $500 were furnished by the state board.

After completion, state aid roads were maintained by and at the expense of the county under state supervision, except that the state paid one-half of the cost of maintaining the bridges of a length of 175 ft. or more when that cost exceeded $100 per year.

Changes by Legislation since 1917: The 1919 legislation established a Department of Public Works to exercise the duties of the former Highway Board. A system of state highways was established and the Department of Public Works is empowered to use all or any part of each county's allotment of the state aid fund to construct the part of the state highway system lying within each county.

The counties are required to improve and maintain such parts of the state system as lie within their borders, according to the direction, specification, and regulations made by the Department of Public Works, and the county is to be reimbursed for the cost of such construction out of the county's share of the state highway funds. If any county fails to improve and maintain the part of the state highway system lying within its borders, the Department of Public Works may cause the work to be done and charge the cost to the county's share of the highway funds. One-half the cost of bridges for which the county requests aid may be paid by the state.

Plans and specifications for such bridges are to be furnished by the state engineer, and the construction is to be under the joint supervision of the Department of Public Works and the county board.

The county is required to maintain the bridges so constructed, providing the cost of such maintenance does not exceed $100 per year. If the cost does exceed that amount then the whole cost shall be borne equally by the state and county.

Nevada

1917 Procedure: The state rendered financial aid to the counties for the construction of roads and bridges.

State aid for roads was granted only to those counties in which no state roads had been constructed. Such counties received annually from the state an amount equal to their contribution to the state highway fund through the 0.7-mill state-wide tax less the proportionate share of the overhead cost of the State Department of Highways.

The roads constructed with this money were required to conform to standards of construction prescribed by the State Department of Highways, and upon the request of the county the state highway engineer would supervise the construction.

Maintenance of such roads was executed by the county at county expense.

Changes by Legislation since 1917: The 1919 legislation established a state highway system which included the necessary bridges and is to be constructed and maintained by the State Department of Highways, the cost, in general, to be borne by state and federal funds; but in certain counties it was provided that, at the request of the county, sections of the state system lying within said county should be constructed by the county after surveys, plans, etc. have been made by the Department of Highways. The construction should be performed to the satisfaction of the State Department of Highways, but the county should pay the whole cost of the surveys, plans, and construction from regular or special county funds.

New Hampshire

1917 Procedure: The state rendered financial aid to the towns in road and bridge construction.

Two classes of highways received state aid. For the first class, known as "trunk line highways," the state paid generally 50% of the cost, though a larger percentage might be paid in aid to the poorer towns. For state highways, the state paid from 1-6 to ¾ of the cost, dependent on and in inverse ratio to the assessed valuation of the town affected.

Federal aid plans, etc. for both classes of roads were made by the state highway commissioner.

"Trunk line highway" were constructed by the State Highway Department. State aid roads were constructed by the town boards under state inspection and supervision.

Both classes of roads were maintained by patrolmen under the supervision of the State Highway Department, with state and local funds.

Changes by Legislation since 1917: There have been no changes in the procedure as outlined for 1917.

New Jersey

1917 Procedure: The state rendered financial aid for road and bridge construction to the counties and towns.

The state paid 40% of the cost of road construction and the county the remaining 60%, except that a town could cooperate with the county, in which case the town paid 10% of the cost, leaving 50% to be paid by the county.

Surveys, plans, etc. for state aid roads were made by the county engineers, subject to state approval.

Immediate supervision of construction rested with the county or town interested, subject to general inspection and supervision by the State Highway Department.

The maintenance was effected by the counties or towns, subject to general supervision by the state. The state usually paid 50% of the cost of such maintenance and could compel satisfactory performance by withholding future allotments in case of failure.

Changes by Legislation since 1917: There have been no changes in the procedure as outlined for 1917.

New Mexico

1917 Procedure: The state rendered financial aid to the counties for road and bridge construction.

The law provided that the county contribution might in no case exceed 50% of the total cost of the state aid road and no provision was contained therein whereby the State Highway Department could compel any participation by the county.

Surveys, plans, etc. were made by the State Highway Commission and the construction was carried on under the supervision of the state highway engineer, except that, if the estimated cost of the work was less than $1,000, the road might be built by the county.

Maintenance was executed by the State Highway Commission at equal state and county expense.

Changes by Legislation since 1917: The 1919 legislation provided that roads built with state aid, known as state roads, should be maintained by and at the expense of the state, and provided that the expense of such maintenance should be deducted from available state funds before they were apportioned to the counties for state aid construction as provided in former acts.

New York

1917 Procedure: The state rendered financial aid to the counties for road and small culvert construction.

The share of the counties in the cost of state aid road construction was fixed at 2% of the assessed valuation of the county per mile of county road, outside of cities and corporations, provided that such participation did not exceed 35% of the cost of the state aid road constructed. In general, the amount contributed by the county varied from 8% to 35%, but with the consent of the county board of supervisors, the county's share could be increased to 50%. Bridges and culverts over 5 ft. in span were required to be provided by the towns.

Surveys, plans, etc. were made by the state and approved by the board of county supervisors.

Construction was carried on under state supervision, and though the state did not participate in the cost of constructing the bridges on state aid roads, it was required that such bridges be constructed under state supervision.

Maintenance was executed by the state, the state and county funds being proportioned as for construction.

Changes by Legislation since 1917: There have been no changes in the procedure as outlined for 1917.

North Carolina

1917 Procedure: State aid to counties for road and bridge construction was limited to advice and to surveys and plans by the State Highway Department.

The state exercised no supervision over the construction of state aid roads, except at the request of the county.

State highways constructed according to plans furnished by the state were maintained by and under the direction of the state highway engineer, the cost of such maintenance being paid from the net automobile revenues which were apportiond to the counties for this purpose.

Changes by Legislation since 1917: The 1919 legislation provided for a system of state highways to be surveyed, planned, constructed, and maintained by the State Highway Commission, the net motor vehicle revenues to constitute a fund for this purpose. The cost of constructing such roads is to be shared one-fourth by the county, one-fourth by the state, and one-half by the Federal Government.

North Dakota

1917 Procedure: The state rendered financial aid to the counties for road and bridge construction.

The cost of constructing state aid roads was borne equally by the state and county.

Surveys, plans, etc. were made by the state engineer, and construction was under the supervision of the state engineer.

After completion, state aid roads were maintained by the county, at the joint expense of state and county, subject to inspection and supervision by the state engineer.

Changes by Legislation since 1917: It is believed that some changes have been made in the 1917 state aid procedure by 1919 legislation, but the session laws of the state for 1919 are not yet in hand.

Ohio

1917 Procedure: The state rendered financial aid to the counties and towns for the construction of roads and bridges.

In general, the cost of state aid road construction was borne 50% by the state, 25% by the county, 15% by the township, and 10% by the abutting property owners, these amounts varying to some extent with the town's valuation of the property of the county and township. The cost of culverts and bridges was borne entirely by the state and county.

(Continued on page 212)

GOOD ROADS
CONSTRUCTION TRANSPORTATION MAINTENANCE

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DETOURING THROUGH TRAFFIC

While there is nothing new in the suggestion that detours, or by-passes around populous cities and towns, be provided for through traffic, the growing congestion in centers of population makes the matter one of prime importance.

The layout of the streets in the centers of most cities and towns is the result of haphazard growth, not of careful planning, and is not at all adapted to the needs of modern traffic. The ordinary traffic of the cities themselves taxes the capacity of the streets in their centers, especially at intersections. When through traffic is added the result is often confusion, delay and danger.

Under present road conditions, however, the use of the streets leading through the centers of cities and towns is almost unavoidable. The main roads between cities naturally have their termini at or near the centers of business. These are ordinarily the better paved highways, and through traffic follows them, especially if drivers are not so thoroughly familiar with the cities that they can find their way through less heavily traveled and less direct streets.

The average driver would much prefer some route through the side streets of the cities he is obliged to pass through, because following such route would involve less effort and enable him to make better time. But to make such detours popular, they would have to be well paved and plainly marked throughout their lengths.

In the majority of cities and towns of large or moderate size it would be comparatively easy to provide such detours. The municipalities could well afford to bear the cost of paving and marking, merely as a measure for the relief of traffic congestion.

SPRING WORK ON EARTH ROADS

At about this time of the year, the date depending upon the season and the latitude and altitude of the part of the country, most rural road authorities undertake the annual "working" of the earth roads within their jurisdiction. And because so large a part of the country's road system consists of practically unimproved earth road, the way in which this operation is carried out is a matter of very real concern.

While there are many ways of performing spring work on the earth road, one of the most common—unfortunately—is to wait until the frost is out of the ground and the roadbed has thoroughly dried out and then go over it with a road machine, scraping out the ditches and piling in a windrow along the center of the traveled track leaves, sod, twigs, roots, stones, and all the other debris that has collected since the last working. That this method of using one of the most valuable of the road maker's machines is entirely wrong should be evident, but doesn't seem to be.

The road machine, more correctly designated, perhaps, as a road grader, is a particularly useful machine for earth road work. It can be used to advantage in many different ways, but the work described is not one of them.

LIMITS OF MOTOR TRUCK HAULING

Ever since motor trucks came into general use for the carrying of commodities between cities, there has been much discussion as to the maximum distance over which such service could be used economically. In view of this, particular interest attaches to the conclusion reached in a paper on "Motor Truck and Railroad Freighting," printed on other pages of this issue.

The author of the paper, W. J. L. Banham, General Traffic Manager of the Otis Elevator Co., summarizes the results of his study of the carrying of l. c. l. shipments as follows:

"In general, I am of the opinion that motor truck transportation can, and should, compete successfully with the carriers to short-haul points. The delivery time is all in favor of the motor truck, and I am satisfied if the manufacturers will take into account all the various costs and charges which are part of a true freight transportation cost, that motor trucks can be operated successfully in competition with the carriers for distances of between 10 and 125 miles."

It should be noted that the author directs attention to the necessity of taking into account "all the various costs and charges which are part of a true freight transportation cost." This is important, for those costs include many that are probably often lost sight of in comparing the two methods of hauling. They comprise, according to Mr. Banham, "all expense involved in making a shipment," from the boxing or packing cost to the cost of unloading at the consignee's door. And they also include the greater proportionate freight charge for less than carload shipments, and the possible incidental expenses such as tracing shipments that go astray, delays in transportation, the clerical work of taking care of freight shipments, and the like.

One of the great needs in the field of motor truck hauling is organization and systematizing. At present the field is chiefly occupied by individuals or small companies, operating comparatively small fleets and working more or less in a haphazard manner. This handicap is being partly overcome in some localities by the formation of associations of motor haulage concerns and by such steps as the establishment of a union depot for motor freight in Toledo, Ohio, which was noted in "Good Roads" for April 7.

Another pressing need is a better system of improved roads. Trucks do not make transportation, of themselves, nor can the most thorough organization of haulage interests operate without roads.

With good roads and well organized operators, the motor truck should be able to compete successfully with the railroad over even greater distances than those set by Mr. Banham.

Urges Delay in Ohio Highway Program

Recommending the suspension of road building activities in Ohio until a more favorable economic situation obtains, A. V. Donahey, State Auditor, recently sent a letter to A. R. Taylor, State Highway Commissioner. Mr. Donahey pointed out that on the first six contracts awarded in 1920, the average cost per mile is $35,893. These contracts embrace 15.5 mi. of macadam, brick, concrete and bituminous pavements. It was also pointed out that on March 25, thirteen contracts embracing 44 mi. were offered and that only two bids were received.

Bill for Transfer of Additional War Equipment to Highway Departments

A bill has been introduced in the House of Representatives proposing the transfer of additional surplus equipment held by the War Department to state highway departments for use in road building. Among the items specified are 500 10-ton caterpillar tractors, with spare parts; 200 mobile shop units; and shop machinery, tools and equipment for the repair of motor vehicles. Under the provisions of this bill, the state will pay 20% of the estimated value of the equipment, from which value may be deducted freight charges.

Cooperation Between Engineers and Contractors in the Execution of Highway Programs

(Continued from page 207)

on two wheelbarrows of sand and four wheelbarrows of stone." But to offset that, there was onec a contractor on a job—and I guess it was his first contract—who asked what the 1:2:4 meant and the inspector said: "Why, that means one barrel of cement, two wheelbarrows of sand, and four wheelbarrows full of stone."

So it was evened up a bit.

I could cite a lot of other instances which might be interesting, but after we talk it all over, there is a general understanding between contractors and engineers and what we want to do is to perfect that. They both want to get a good job, if they don't want anything else. Even a dishonest engineer wants to get a good job. I think it has been truly said that the first ideal of a contractor is to get a perfect job, but the most important feature, from a contractor's point of view, is to make money. Now I think those are perfectly legitimate; his first idea is to get a good job, and the most important point is to make money. But I think the first ideal of contractors is to get a good job.

Now I think we could ramble on for a long time, but each one of these points will come right back to those six points—the six points of cooperation, I will call them. The first is, subtantial administration and good engineering; second, reasonable and definite specifications; third, competent and experienced inspection. From the contractor's side: First, sufficient and satisfactory equipment; second, adequate funds; third, competent and efficient personnel. I think you will agree with me that if those points are carried out, both by contractors and the engineers, it will be difficult to have anything but close cooperation.

Status of State Aid to Counties and its Future Development

(Continued from page 210)

Surveys, plans, etc. were made by the county surveyor or by a state resident engineer and were approved by the state highway commissioner and the county or township interested.

Construction was carried on under the supervision of the county surveyor or the state resident engineer, and inspected at intervals by representatives of the state highway commissioner.

Maintenance was executed under the immediate direction of the county surveyor and under the general direction of the state deputy, generally at state expense; but it was provided that the county or town might pay a part of the cost.

Changes by Legislation since 1917: There have been no changes in the procedure as outlined for 1917.

Oklahoma

1917 Procedure: The state rendered financial aid to the counties for road and bridge construction.

In general, the state and county shared equally in the cost of construction. There were some exceptions. State convicts might be furnished in lieu of or in addition to money aid, the "extra" expenses being borne by the county. According to the procedure followed, the state commissioner of highways might or might not supervise the highways and the preparation of plans, etc., but it was required that they should have his approval.

Construction might or might not be carried on under state supervision, dependent upon the kind of aid extended.

Maintenance was executed by the county board, at county xpense, subject to inspection and instruction of the Department of Highways.

Changes by Legislation since 1917: By 1919 legislation the boards of county commissioners are required to select for improvement, as part of the state road system, not less than 10% nor more than 15% of the total county mileage, the selected roads to be main traveled roads connecting with state roads in adjoining counties. In case any county failed to make such selection, the designation should be made by the Department of Highways and the cost charged to the county. The State Department of Highways must approve all plans and specifications for sections of this system, but the plans, etc. are to be prepared by the counties. The construction is to be carried on under joint supervision of the State Department of Highways and counties. The state highway construction fund is to be apportioned to the counties as follows: One-half in the ratio which the area of the county bears to the total area of the state, and one-half in the ratio which the population of the county bears to the total population of the state, provided that the county shall furnish sufficient funds to equal the state apportionment. Parts of the state road system thus constructed are to be maintained by the county with county funds to the satisfaction of the commissioner of highways, the penalty for failure to make proper maintenance being the withholding of future state aid.

(To be Continued)

———OOO———

Lebanon County, Missouri, in a special election on March 16, voted for a bond issue of $85,000 for road work. A short time ago the county voted an issue of $100,000 for road work, which was declared illegal because of a technicality in the law.

HIGHWAY TRANSPORTATION

Motor Truck and Railroad Freighting*

Comparison of Cost, Range and Service of Moving L. C. L. Shipments via Freight to Short-Haul Points and the Moving of the Same Class of Freight by Means of Trucks

By W. J. L. BANHAM†

Users of motor trucks should consider to what extent they can be operated in comeptition with hort-haul freight movement. The principles involved are: First, service; second, cost.

There seems to be no question at the present time that the carrying of less than carload shipments to short-haul points by the rail carriers is not only expensive to the shippers, but is also unprofitable to the carriers. Until recently it seemed to be almost necessary for the shippers to use the rail carriers for the movement of their less than carload shipments to nearby points, regardless of expense and delay, as there did not seem to be any organized effort made by the motor truck operators to take care of this class of freight.

It is extremely difficult for the carriers to figure cost of transportation of package freight hauled short distances and particularly to such points at which they do not have a through car movement. The expense of transferring the less than carload shipments one or more times when moving within 50 mi. of the receiving station, and the additional expense caused by delay of equipment, have been recognized by the Government, with the result that the United States Railroad Administration during the war ruled that freight destined within a certain radius would not be handled by the rail carriers. It was necessary, therefore, for the shippers to find other means of tranporting this class of freight. Motor truck transportation, while still in its infancy at the present time, pointed a way to the shippers whereby their less than carload shipments could be handled not only more promptly, but at a considerable saving both to the shipper and to the receiver of freight alike.

While it is true that it is almost imposible for the carriers to figure the exact cost of handling short-haul freight, it is equally as difficult for the shippers to ascertain the cost of transporting similar freight. The question of cost brings me to the first part of my subject, and in order to make it clear as to what I mean by costs and what these costs cover, I am going to refer to them as transportation costs. Transportation costs do not necessarily mean less than carload freight rate and motor truck rates, although both rates are a part of the transportation costs.

What I understand to be a true transportation cost is all expense involved in making a shipment, starting with the boxing or packing expense, together with handling expense in the shipping department, the loading of freight on teams for delivery to the freight house, teaming charges from the shipping department to the local freight house, and additional labor incidental thereto. To this must be added the less than carload freight rate and additional charge for cartage at the delivery point, with such other expenses as may be caused by requests for tracing, duplication of shipments lost or damaged in transit, entering of claims, checking of freight bills, delay to shipments in transit, and the expense of carrying additional stock to take care of freight in transit when moving via rail carriers.

All of these costs are properly transportation costs, and are part of the shipping expenses which are paid either by the shipper or receiver.

If you will make an analysis of the charges covering your shipments it will be of interest to you to know the amount it costs to make less than carload shipments, and if you will compare these costs against the same shipments moving via motor truck, you should be in position to eliminate a number of the cost items, by reason of the fact that it is not necessary to go to the same expense for packing or boxing freight shipments when moving via motor truck, inasmuch as there is usually no transfer in transit.

For the information of truck users I have compiled some figures showing the cost of freight movement, compared with the same movement via motor truck. These figures are worked out on an average basis.

In practically every instance, it is necessary to prepare material for freight shipments in an entirely different way than if it moved via motor truck, direct from the shipper to the receiver. It is necessary to go to considerable additional expense for boxing or crating or to protect by other means, in order to prevent loss or damage in transit. This additional packing expense is necessary on account of the number of handlings the less than carload shipments receive at the hands of the teamsters and carriers after the material leaves the shipping department.

We have included in the freight cost the first-class rate plus 30 ct. per 100 lb. teaming charges at shipping and receiving point. To these costs must be added 17% for the cost of carrying the increaed weight caused by heavy boxing, and 24 ct. per 100 lb. for the increased cost of boxing. The rate via motor truck covers delivery from the shipper's warehouse to the receiver's warehouse. I have averaged this rate, and believe it to be a fair one to use in comparison with the freight cost movement.

The rates that I worked out are based on Newark. I understand that in the freight cost item are included the various item that I have referred to, such as additional crating, additional labor and so on. I find on shipments moving from Newark to Yonkers, that if we combine all the costs, that is additional costs to make a less than carload shipment, the rate averages $1 per hundred. If you take the same movement by motor truck, with decreased boxing, decreased weight, and decreased labor, you will find that the rate averages 20 ct. Between Newark and Yonkers there is a difference of 80 ct. per 100 lb., in favor of the motor truck.

The following table gives cost differences for varying distances:

	Road Miles	Freight Cost per 100 lb.	Motor Truck Cost per 100 lb.
New York City	12	$ .88	$ .15
Passaic, N. J.	6	.88	.15
Paterson, N. J.	10	.88	.18
Trenton, N. J.	51	.88	.55
Philadelphia, Pa.	88	.98	.75
Bidgeport, Conn.	70	1.12	.75
New Haven, Conn.	87	1.12	.85
Providence, R. I.	214	1.21	1.15
Port Jefferson, L. I.	71	.98	.75
Asbury Park, N. J.	46	.94	.45

I have quite a number of other figures, but those explain themselves, and they average about the same all the way through.

One of the greatest savings made possible by motor truck transportation is that of lumber and other material used for packing, together with additional labor and other charges incidental thereto. The amount of this saving, however, will be controlled largely by the material to be boxed or packed, and how much less protection can be used when moving via motor truck as against a less than carload movement via freight.

---

*Paper presented at the Highway Transport Conference held in connection with the New York Motor Truck Show, New York, N. Y., Jan. 3-10, 1920.

†General Traffic Manager, Otis Elevator Co.

While some will save more and others less, depending upon product to be shipped and conditions, the great possibilities of saving warrant careful study of the problem.

Have you taken into consideration the amount of material you have in transit which is not producing any revenue, either to the shipper or receiver, while it is in the hands of the carrier?

Have you considered the amount of space you use in your shipping department in order to prepare your shipments to move via freight?

Have you considered how much less space you will need in your shipping department if you can materially reduce the amount of boxing and packing used on your shipments?

Have you considered the amount of lumber it is necessary for you to carry for boxing, the space necessary to store it, and the amount of freight charges you pay on wet lumber, if it is stocked in the open, as is usually the case? Boxing lumber will frequently carry from 10% to 25% of its weight in moisture, unless it is passed through a dry kiln before being used for boxing purposes.

Could you not use any space which can be saved by changing your shipping methods for manufacturing purposes?

Have you considered the amount of material and money your company has tied up, by reason of the fact that you are unable to state definitely how long it will take to deliver by freight between your factories and your customers?

If a freight movement takes 30 days as against 1 day via motor truck, would it not be to the advantage of your company to use the difference in time, 29 days, for manufacturing?

Have you considered the amount of expense to manufacturers and others for storing and handling their products on account of uncertainty of freight delivery?

Any comparison between rail carrier movement and motor truck movement is entirely in favor of the motor truck, as it is necessary for the motor truck operators to make delivery in the shortest possible time, in order to operate their equipment financially successfully.

What is needed at the present time is organization on the part of the motor truck operators, in order to secure heavier loading and eliminate so far as possible motor trucks returning without a full load.

In general, I am of the opinion that motor truck transportation can, and should, compete successfully with the carriers to short-haul points. The delivery time is all in favor of the motor truck, and I am satisfied that if the manufacturers will take into account all the various costs and charges which are part of a true freight transportation cost, motor trucks can be operated successfully in competition with the carriers for distances of between 10 and 125 mi.

EQUIPMENT—TRADE—MATERIALS

Dragline Cableway Excavator Used at Gravel Pit

Contractor Used Dragline Cableway to Convey Material from Pit to Bin from which It was Carried to Job by Truck

By taking over an idle gravel pit and installing up-to-date labor saving equipment, the Des Moines Asphalt Paving Co. effected a considerable saving in the cost of aggregate for the concrete base on a large paving job at Estherville, Iowa.

The mixing operations called for approximately 200 cu. yd. of sand and gravel daily. To meet these requirements, the company installed a 300-ft. span, ½-cu. yd. Sauerman dragline cableway excavator and a storage and loading bin. The plant is shown in the accompanying illustration.

SAUERMAN DRAGLINE CABLEWAY EXCAVATOR IN OPERATION AT GRAVEL PIT

The dragline cableway excavated the material and conveyed it to the bin, from which it was measured into trucks after being passed over grizzly bars to remove the over-size stones. Further screening of the sand and gravel was unnecessary, as the materials were of such uniform composition that they could be used in practically their natural state as aggregate for the concrete foundation.

The teams and scrapers shown at the right-hand side of the illustration were used to remove the overburden that covered the sand and gravel to a depth of several feet. At one end of the pit, this overburden had been removed several years previous to the operations described and a wagon pit had been opened. Work with the dragline cableway was commenced in this old pit which had been excavated to a depth of only 5 or 6 ft., leaving some 15 ft. of good material still available. While the cableway was working out the old pit, the scrapers were utilized for removing the overburden on the remainder of the deposit preparatory to swinging around the outboard end of the cableway and enlarging the pit.

It is pointed out that it is generally good practice to use teams and scrapers for stripping, although the cableway can be so used. In this particular case, however, gravel excavating by the cableway would have been interrupted if the equipment had been used for this purpose.

Ford trucks equipped with Lee end-dump bodies were used to carry the materials to the job. Handling was reduced to a minimum, as the trucks were loaded directly from the bin and were dumped into the mixer skip. Three bags of cement and 1 cu. yd. of aggregate were carried at each trip. The average haul for the entire job was about 3 mi. and it was found possible to keep the mixer supplied with materials by employing 6 or 7 of these light trucks.

Goodyear Tire and Rubber Company Establishes Good Roads Bureau

Will Collect Highway Data and Distribute Literature to Promote Interest in Better Roads—C. M. Wood Head of Department

The Goodyear Tire & Rubber Co., of Akron, O., has recently established a Good Roads Bureau, with C. M. Wood in charge. This department will gather data on the cost of roads, methods of taxation and other information. It is the function of the bureau to work for the promotion of good roads, paying especial attention to seeing that hard-surfaced roads are so constructed that they will be adequate for the needs of transportation in future years and that they are wide enough for trucks to pass without getting off the hard surface.

C. M. Wood, who has been placed in charge of this department, was formerly sales manager of the H. W. Johns Manville Co., and at one time department manager of the Portland Cement Association. Mr. Wood states that the bureau will distribute reliable data on good roads, promote road movements by lectures, personal calls and advertising, collect data on highway legislation and will prepare and distribute literature for the public.

"Keep the Cement Sacks at Work"

Statement from the Portland Cement Association Urging Return of Sacks

One empty sack at the cement mill is worth any number of them lying idle in dealers' or users' hands all over the country, in so far as shipment of cement is concerned. Like many other kinds of cotton goods, cement sacks are scarce. If every idle cement sack in the country were returned to the plant which sent it out, there would be considerable relief of the present shortage both of cement and sacks.

Besides, cement sacks cost you money—which is not working for you so long as you keep the sacks in your possession and thus make it impossible for the manufacturer to buy them back.

This condition is simply another one of those seemingly trifling items of neglect that in its own way is contributing to keeping the wheels of industry from moving as regularly and as smoothly as we all would like.

If a cement plant ships 1,000,000 bbl. of cement a year, in sacks, 4,000,000 sacks are necessary to take care of this shipment. Under actual conditions, when shipments are made every day, the cement plant at the end of the year finds itself short of a very large number of sacks, because dealers or cement users have not returned all they had received. The following year, therefore, it is necessary to supplement the stock of sacks by purchasing new ones. Sooner or later some sacks are certain to be lost through neglect or because put to improper use and thereby permanently kept from being again used as cement containers. No one knows exactly what becomes of them, but if lost while in your possession, it means money lost to you.

Many building and highway contractors have shown commendable enterprise in purchasing and storing, during the past winter, large quantities of cement in anticipation of immediate need when the construction season opens. Naturally, this has temporarily prevented the circulation of many cloth sacks. Nevertheless there are enough empty sacks in users' and dealers' possession throughout the country so that, if returned to the cement mills, the number held out of circulation through storage of cement would be relatively insignificant.

Remember, cloth cement sacks represent an outlay of money by you until you have returned them for credit, and if they are not returned promptly, the cement manufacturer must provide new containers to take care of his business with you. This represents an unnecessary waste, because far more containers must be manufactured and used than would actually be necessary if every cement sack were kept at work.

Take care of cement sacks!

Keep them at work!

Return them propmtly so the cement manufacturer can ship the cement you want.

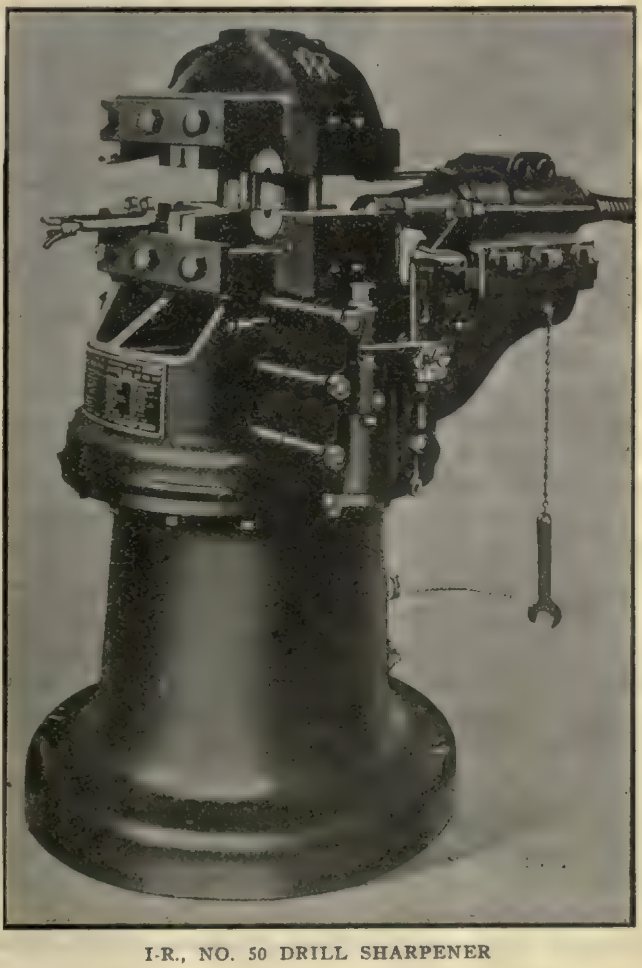
New Drill Steel Sharpener

A new drill steel sharpener operated by compressed air has recently been put on the market. It was designed primarily to rapidly and exactly sharpen and shank drill steel. When fitted with special devices it will perform other functions, such as forge boltheads, pins, stanchions, etc.

A single lever controls all operations of the machine and is fitted with a safety locking device. The throttle valve is of the balanced spool type, operating easily and quickly.

The hammer drill cylinder is of improved valveless type, permitting the hammer to deliver fast and powerful blows against the end of the dolly, upsetting the steel and so forming the bits and shanks with rapidity. The base of the machine is strong and rigid and no foundation is required. Lubrication is effected by the I-R "heartbeat" lubricator, doing away with sight feed and other exposed lubricators. Cup leathers are eliminated in the machine and only accurately machined snap piston rings are used.

The machine is known as theI-R. No. 50 sharpener and is manufactured by the Ingersoll-Rand Co., of New York, N. Y.



I-R., NO. 50 DRILL SHARPENER

MEETINGS

Calendar of Coming Meetings

May 10-11—American Association of Engineers.—Annual meeting, St. Louis, Mo. Secretary, A. H. Krom, 63 E. Adams St., Chicago, Ill.

May 13-15—League of Texas Municipalities.—Eighth annual convention, Dallas, Texas. Secretary, Frank M. Stewart, University of Texas, Austin, Texas.

Federal Highway Council

A conference on the problems connected with the development of highway transportation was held April 5 by the Transportation Bureau of the Federal Highway Council at Washington, D. C.

Congressman Esch, of Wisconsin, Chairman of the Interstate and Foreign Commerce Committee, expressed the opinion that the motor vehicle is a vital link in the country's general transportation scheme, and that the railroads are not antagonistic to the entrance of the motor truck into the transportation field. He also expressed the belief that as roads are built of such character as to make highway rate making possible, much of the short haul will shift to the highway, to the economic advantage of the railroads and the general public.

One of the problems, according to Mr. Esch, which will confront the people with the increased use of motor trucks upon the highways, will be a practical rate schedule. It is his opinion that the boundary lines for rate making, or the fixing of maximum and minimum charge, can come only after standardization of the road surfacing, at least to such an extent that operating costs can be determined upon a fairly accurate basis.

Through bills of lading from farm to ultimate delivery in distant city was one of the significant forecasts made by Mr. Esch. He also expressed the conviction that the use of the motor truck and the organization of rural transportation routes will go far toward meeting the farm labor problem by releasing time now spent in hauling for use in greater crop production.

Senator Townsend, author of the proposed National Highway Act, urged the need of a national highway system and explained the provisions of the measure now pending before Congress.

The conference was presided over by S. M. Williams, of Lima, O., Chairman of the Federal Highway Council.

Chamber of Commerce of the United States

The development of the highways and adequate motor transportation will be considered in their relation to industrial production at the meeting of the Chamber of Commerce of the United States which will be held in Atlantic City, N. J., April 27 to 29. A special group meeting has been set aside for consideration of these subjects.

F. A. Sieberling, President of the Goodyear Tire and Rubber Co., Akron, O., Chairman of the Committee on Highways of the National Chamber of Commerce, will preside at the group meeting. Included among the speakers are Col. B. Taylor, Chief, Motor Transport Corps, U. S. A.; Windsor T. White, President of the White Co., Cleveland, O.; Thos. H. MacDonald, Director, U. S. Bureau of Public Roads; Roy D. Chapin, President, Hudson Motor Co., Detroit, Mich.; W. A. Alsdorf, Ohio Good Roads Association, Columbus, O.; A. G. Batchelder, Executive Chairman, American Automobile Association, Washington, D. C.; L. W. Duffey, Chairman, Good Roads Committee, Indianapolis Chamber of Commerce; W. J. L. Banham, General Traffic Manager, Otis Elevator Co., New York, N. Y.

PERSONAL MENTION

G. M. Jowers was recently appointed engineer of Val Verde County, Texas.

Shelton Dawson was recently appointed city engineer of Charles City, Iowa.

D. R. Thornton has resigned as county engineer of Jefferson County, Texas.

Frank W. Parks has resigned as town superintendent of highways of Lewiston, N. Y.

Alexander Reid has succeeded F. W. Parks as superintendent of highways of Lewiston, N. Y.

T. G. Kitchen has resigned as city surveyor of Lambertville, N. J., and entered private practice.

A. C. Love has been appointed engineer for Division No. 8 of the Texas State Highway Department.

J. A. Griffin has been appointed city engineer of Los Angeles, Cal., succeeding the late A. C. Hansen.

F. F. DuBose, formerly Office Engineer of Dallas County, Texas, is now with Pott & Prentice, Waco, Texas.

G. R. Abney, formerly with the Texas State Highway Department, is now county engineer of Jefferson County, Texas.

U. Stephens has resigned as acting city engineer of Waco, Texas, and is now with the Texas State Highway Department.

A. R. Clucas, formerly Assistant City Engineer of Vancouver, B. C., was recently appointed town planning engineer for Birmingham, England.

J. R. Ellis resigned recently from the Missouri State Highway Department and is now with Winston Lee Winters, of Fort Smith, Ark., as principal assistant engineer.

E. E. Brandow, formerly Bridge Engineer with the New York State Highway Department, is now bridge engineer with the Pennsylvania State Highway Department.

D. C. Reeves has been appointed domestic sales manager of the Holt Manufacturing Co., of Peoria, Ill. He was formerly with the J. I. Case Threshing Machine Co., Inc., as tractor sales manager. Mr. Reeves was born in Missouri and is a graduate of the University of Michigan. Before joining the Case organization in 1916, he was in the automobile business as a partner in the firm of Hal Bros. & Reeves. In 1913 that firm engaged in the sale of tractors. Mr. Reeves has a wide acquaintance in the tractor field and will devote himself largely to the Holt Company's "cater-

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

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*Illustrated article

White Trucks

Do The Most Work
For the Least Money

The White Company
Cleveland

This Dustless, Weedless Road Will *Not* Rut, Ravel or Wash Out

The secret of its lasting, wearing surface is due to the fact that the highway engineer who constructed it realized that he must retain the filler in the top course. To do this it was necessary to keep the top course moist until the cementing qualities of the stone had sufficient time to be rolled and compacted together by the traffic. To accomplish this he used

SOLVAY
Granulated
Calcium Chloride

The material has all the advantages of other preparations but none of the disadvantages. It is clean, odorless, dry, does not track, keeps the road in a damp, cool condition, drawing the moisture from the air at night and retaining it during the day. This prevents deterioration and raveling.

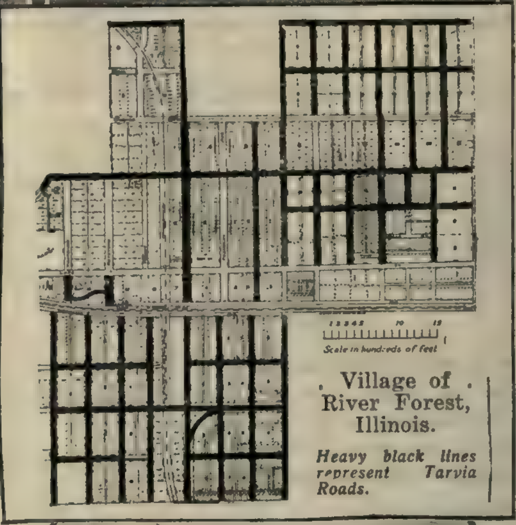
Freight rates on Solvay Calcium Chloride are comparatively small and no heavy, cumbersome machinery is necessary. With a good spreader weighing about 400 pounds a satisfactory job can be done at a cost of about $.0001 per square yard. This can often be reduced if work is done by a regular patrolman.

Send for a Free Copy
of "Solvay Road Book."

SEMET-SOLVAY COMPANY
416 Milton Avenue, SOLVAY, NEW YORK

Oak Ave., River Forest, Ill. Waterbound macadam. Maintained with Tarvia.

Augusta Street, River Forest, Ill. Constructed with "Tarvia-X" in 1913



Village of River Forest, Illinois.

Heavy black lines represent Tarvia Roads.

The Best Streets in Cook County—

IN 1912 the Village of River Forest, Cook County, Ill., began using Tarvia for constructing and maintaining its streets. This is the same county in which Chicago is located.

After seven years of experience with Tarvia, and with Barrett service, Mr. Arthur S. Hatch, Village Clerk, writes us this letter:

> **"I wish to express to The Barrett Company my appreciation for the excellent services rendered the Village of River Forest, both as to the Tarvia furnished and the satisfactory application of same to our pavements.**
>
> **"As you know, nearly every macadam street in our village is treated with Tarvia, and we believe that we have the best streets of any city, town or village in Cook County."**

It is one thing for a community to use a road material occasionally for some special purpose. But it is quite another thing—and very much more of a proof of the material's worth—to have the community adopt that material and use it in increasing quantities, season after season, as River Forest has done with Tarvia.

The black lines on the map are most effective proof that River Forest's village authorities and taxpayers alike are strong for Tarvia. Tarvia gives them mudless, dustless, automobile-proof roads at low cost, and after all, that is what every community is looking for, isn't it?

Above: Washington Blvd., looking east from "Soo" R. R. viaduct, River Forest, Ill. Waterbound macadam treated with "Tarvia-B" in 1914 and 1916; "Tarvia-A" in 1918 and 1919.

Illustrated booklet telling about the various Tarvia treatments, free on request. Address nearest office.

Special Service Department

This company has a corps of trained engineers and chemists who have given years of study to modern road problems. The advice of these men may be had for the asking by any one interested. If you will write to the nearest office regarding road problems and conditions in your vicinity the matter will be given prompt attention.

Tarvia

Preserves Roads–Prevents Dust

New York Cincinnati Minneapolis Atlanta Lebanon
Chicago Pittsburgh Dallas Duluth Youngstown
Philadelphia Detroit Nashville Salt Lake City Milwaukee
The Barrett Company
Toledo Columbus Richmond Latrobe Bethlehem
Boston New Orleans Syracuse Bangor Elizabeth
St Louis Birmingham Seattle Washington Buffalo
Cleveland Kansas City Peoria Johnstown Baltimore

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GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

WITH WHICH IS INCORPORATED

THE HIGHWAY CONTRACTOR AND ROAD BUILDER

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JAMESTOWN, N. Y., APRIL 28, 1920

Number
17

The Industrial Railway in Road Work

Contractors in Illinois and Michigan Employ Industrial Railroads and Other Up-to-Date Plant in the Construction of Concrete Roads

With much larger appropriations for road work than have ever before been available, the larger contracting organizations that heretofore have confined their operations chiefly to other fields are turning their attention to road building. At the same time, the constantly increasing costs of labor and materials and the difficulties of obtaining both are making it more and more of a problem to carry on construction at a profit. These factors are mainly responsible for the growing use of labor saving equipment and the development of methods tending to reduce the amount of hand labor required.

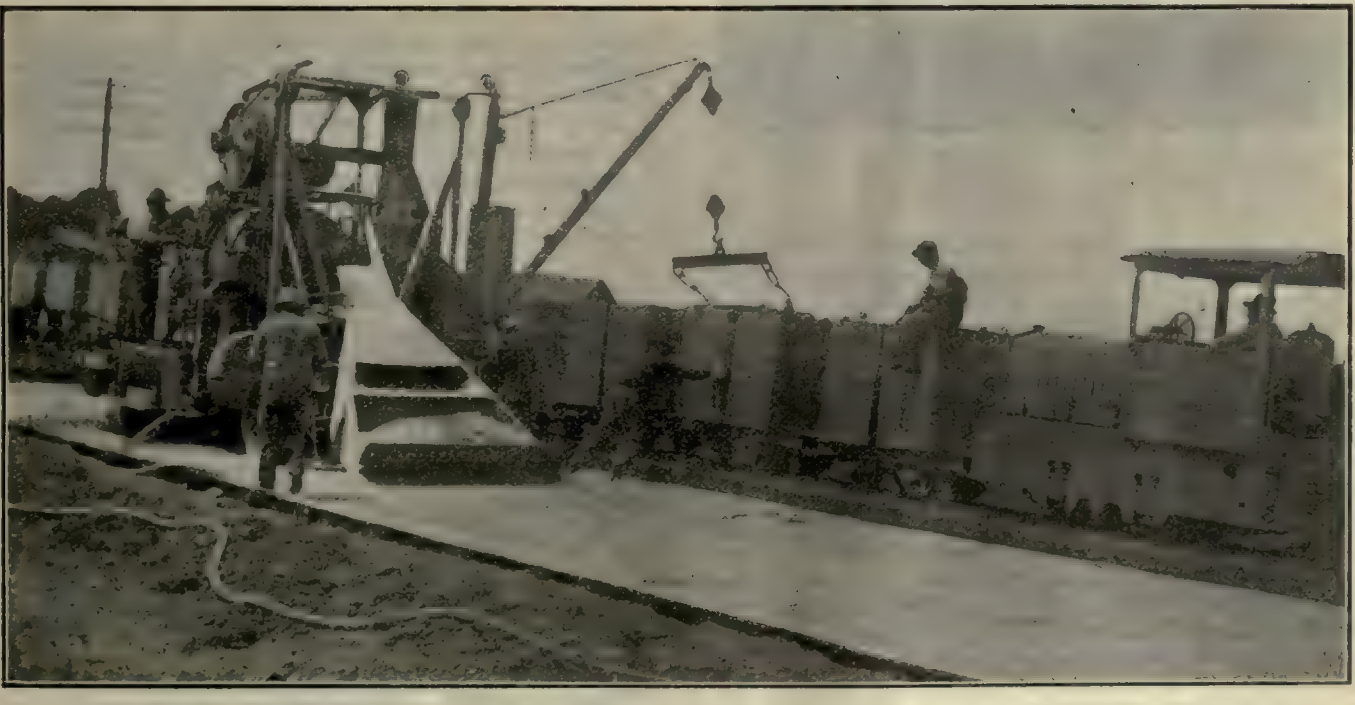
One of the noteworthy manifestations of this tendency in the field of highway contracting is the utilization of the industrial railway. Attention was called to this at the recent convention of the American Road Builders' Association by C. S. Gale, of the Delaware State Highway Department, who said:

"The time is coming when we are going to have large contracting firms, composed of engineers and practical men, who are going to have four or five units out. I think that the equipment for handling materials is going to be largely confined to two things—trucks and industrial railroads. The truck can haul almost anything necessary to take upon the road, and the industrial railroad can be used in all cases where the grade is not excessive, say 5%."

Two examples of the use of the industrial railroad in highway work are the building of about 6 mi. of concrete pavement near Batavia, Mich., and the construction of some 20 mi. of similar pavement on the Lincoln Highway near Geneva, Ill.

The former is a 16-ft. pavement, 8 in. thick at the center and 5 in. at the sides. The industrial railroad equipment comprised 3-ton and 6-ton Whitcomb gasoline locomotives, about 100 cars with batch boxes, and 2-ft. gauge tracks. Each train consisted of from 10 to 15 cars.

The materials were unloaded at a temporary siding by means of a locomotive crane, converted from a steam shovel, and were placed in bins mounted on flat cars. These cars



DELIVERING CONCRETE MATERIALS TO MIXER BY MEANS OF INDUSTRIAL RAILWAY ON THE LINCOLN HIGHWAY NEAR GENEVA, ILL.

and the crane were on parallel tracks between which were laid the tracks of the industrial railroad running to the mixer on the job. The switching of the industrial cars at the loading station was performed by two teams, this method having been found more satisfactory than the use of the locomotives which could not move to both ends of a string of cars.

The batch boxes were fitted with two doors opening at the bottom. At the loading station the correct amount of stone was first placed in these boxes and then the cement added. The cement bin was stationary and was placed between the two railroads and straddling the industrial track. The cement was removed from flat-bottom cars to the bin by means of a clamshell, and it is reported that the loss of cement by the use of this method was negligible. From this bin the cement was delivered to the boxes by means of a 1-ft. metal pipe having two gates by which the cement was measured. From the cement bin the car was switched to the sand hopper and the sand added, the batch consisting of 30 cu. ft. of stone, 10 cu. ft. of cement and 15 cu. ft. of sand.

The mixing machine was of special design and was mounted on wheels with wide treads. The drum's capacity was about 50 cu. ft. and the mixing and placing were done with a gang of 12 men. The mixer was designed primarily for quantity production and its performance was up to expectations, as seen by the fact that 800 ft. of pavement were often laid in one day.

LOADING PLANT FOR INDUSTRIAL RAILWAY ON CONCRETE PAVING JOB ON A HIGHWAY IN THE VICINITY OF BATAVIA, MICH.

The two locomotives were used double-headed, with the 6-ton switching at the mixing machine and the 3-ton returning to the loading station with the empty batch boxes, where they were handled partly by the teams at that place. When the batches were brought to the mixer, the boxes were handled by means of a crane mounted on caterpillars and rigidly conncted with the mixer to maintain a constant distance. The crane was equipped with a steel device with two I-beams between the two machines. The batch boxes were lifted by means of irons attached to the two doors in the bottom and swung into place. The contents were released, slacking this line and drawing up on the line attached to the secondary I-beam connected with the curved irons at the top of the sides of the box, as seen on the boxes in the accompanying illustration.

On the job on the Lincoln Highway in Illinois, the work was done very largely by machinery, nearly all of the workmen employed being engaged in attending to the machines and operating parts of the equipment.

The equipment consisted of two sets of grading machines, mixers and tampers, with a central loading plant which was moved to three positions during the work, the job being divided into five 4-mi. sections. At the three meeting points of these sections the central loading plant was moved and the two grading and paving outfits worked forward, one starting at this point and working 4 mi. to the next section and the other starting 4 mi. back and working up to this point. On the last section the outfits, because the road constructed was only 20 mi. long, had but 2 mi. each of road to build. Each outfit had 5 mi. of 24-in. gauge track, composed of 15-ft. sections of 25-lb. rails and 7 steel ties. Sidings were laid at both mixers and at the loading station.

The loading plant was a bin with three compartments and straddled the industrial track, discharging into the boxes on the cars. The chutes of the bin were sheet iron boxes with two gates. Two locomotive cranes, shown in the accompanying illustration, and a railroad siding for material cars, were also used at the loading plant. The cranes were equipped with clamshell buckets, and unloaded into the bins, the chutes of which were so planned that they could discharge into several cars at the same time, thus materially shortening the time of loading a train of batch boxes.

The batch boxes were of the bottom dump type and were charged with sand, cement and gravel, in that order. It was found that although the sand stuck a little at the mixer the advantages in handling the concrete outweighed this condition, for if moist sand were placed on the cement, any delay would cause the cement to stick to the bottom when the water of the sand oozed down on it.

The design of the loading station, the arrangement of the tracks and sidings, the operation of the grading and mixing outfits and the laying out of the work were carefully planned and the operations coordinated. In the train schedule the five Whitcomb gasolene locomotives and 100 cars in use were run so that five 20-car trains were always working. One would be at all times taking on a load at the loading station; two trains would be at the mixers, and two would be on their way to the mixers.

The loading bins were flat-bottomed, rectangular structures, rather than the usual hopper bins, it being held that the form selected was cheaper and could be contructed and torn down much more readily than the hopper type, notwithstanding that there is considerable dead storage in the flat-bottom design.

The rate of construction was from 800 to 900 ft. per day, with about 3,000 cu. yd. of grading to the mile, on old gravel surface.

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The Pennsylvania State Road Sinking Fund, which already contains $1,000,000 of Pennsylvania highway bonds, will be increased shortly by $100,000. This sum has accumulated and is now ready for investment.

The Supervisors of Genesee County, New York, have passed resolutions for the construction of the highway extending from Darien to Alexander, a distance of 4.14 mi. The cost is estimated at $165,000, of which the state is to bear half.

Bridges in Annapolis County, Nova Scotia, Canada, have been reported damaged to the extent of $10,000,000 in the recent floods. It will be several months before vehicular traffic over the Annapolis and Lequille Rivers can be resumed, it is said. Four steel bridges, two wooden bridges and several small structures were badly damaged.

Status of State Aid to Counties, and Its Future Development-III*

(Continued from April 21)

Oregon

1917 Procedure: The state rendered financial aid to the counties for road and bridge construction.

State aid was granted to two classes of highways, known respectively as "state highways" and "hard-surface highways" and the cost of state highway construction was shared by state and county, in accordance with special agreements entered into at the time of construction. In the construction of "hard-surface highways" it was required that the county prepare the roadbed and that the state provide the pavement.

Surveys, plans, etc. for both classes were made by the state highway commissioner and the construction was carried out under state supervision.

State highways were maintained by the county under state supervision, the cost being shared equally by state and county. The maintenance of "hard-surface highways" was effected under state supervision, the division of the cost being subject to special agreement.

Changes by Legislation since 1917: The 1919 legislation provides for additional state aid to counties for the construction of "market roads." A 1-mill tax is provided, the proceeds of which are to be known as the "state market road appropriation." This appropriation is to be divided among the various counties in such a manner that each county shall receive an amount at least equal to its contribution, except that no county shall receive in excess of 10% of the whole amount raised. "Market roads" are to be constructed under the supervision of the county court, but must be surveyed, planned, etc. by the State Highway Commission. The counties are required to contribute to the cost of such construction an amount equal to the apportionment from the "state market road appropriation."

Pennsylvania

1917 Procedure: The state rendered financial aid to the counties for road and bridge construction.

The cost of state aid construction was shared equally by state and county.

Surveys, plans, etc. were made by a state district engineer, and the construction was under the general supervision of the State Highway Department.

Nearly one-half the mileage of completed state aid roads was maintained by local forces. The balance was maintained by and at the expense of the state.

Changes by Legislation since 1917: There have been no changes in the procedure as outlined for 1917.

Rhode Island

1917 Procedure: Practically no state aid of any sort was rendered by the state for the construction of either roads or bridges.

Changes by Legislation since 1917: There have been no changes in the procedure as outlined for 1917.

South Carolina

1917 Procedure: The state granted no aid either financially or otherwise to the counties for roads or bridges.

Changes by Legislation since 1917: There have been no changes in the procedure as outlined for 1917.

South Dakota

1917 Procedure: The state rendered financial aid to the counties for the construction of roads and bridges.

The State Highway Department designated the state aid roads and apportioned state funds to the counties, taking into consideration the assessed valuation in each county, provided that at least 80% of the funds collected in each county should be expended in the county, if the county so requested. The proportion of the state and county funds appropriated for each piece of construction was determined by special arrangement in each case.

Surveys, plans, etc. were made by and at the expense of the county, subject to the approval of the State Highway Department.

After completion, state aid roads were maintained by and at the expense of the county, subject to supervision and inspection by the State Highway Department.

Changes by Legislation since 1917: The 1919 legislation created a State Highway Commission authorized to prepare standard plans and specifications for roads and bridges suitable to the needs of the various counties, and to furnish such plans, etc. to the counties, give advice on the construction of roads, and prepare plans and specifications for county bridges, the cost of which exceeds $200.

A system of state trunk highways is provided for, the mileage not to exceed 5,000 mi. Counties are required to maintain the roads designated as trunk highways in passable condition until they can be suitably constructed under the direction of the state commission. Failure by a county possessing sufficient funds to provide such maintenance may constitute cause for the removal of the county commissioners. Seventy-five per cent. of the state highway fund is to be apportioned among the counties on the basis of assessed valuation of property, the remaining 25% to be at the disposal of the State Highway Commission. Surveys, plans, etc. for trunk highways are to be prepared by the county highway superintendent, or other appointed engineer, subject to the approval of the Highway Commission. Construction is to be supervised by the county highway superintendent, or other appointed engineer, under the direction of the Highway Commission. After completion state aid roads are to be maintained by the county in accordance with the directions of the Highway Commission.

Tennessee

1917 Procedure: The state rendered financial aid to the counties for the construction of roads and bridges.

The state paid not less than one-fourth of the total cost of state aid roads and bridges.

Surveys, plans, etc. were made under the supervision of the State Highway Commission and the construction of the roads was also carried on under state supervision.

Maintenance of the roads was executed by and at the expense of the county, under state supervision, but the state had the right to take over the maintenance if funds were available.

Changes by Legislation since 1917: The 1919 legislation creates a Highway Commission; provides for a system of intercounty seat roads to be designated by the Highway Commission; establishes a fund for state aid, to be composed of the net motor vehicle revenues; and provides that one-half of such fund shall be divided equally in aid to the counties, the other half to be used for the construction and maintenance of roads at the discretion of the commission. The roads and bridges to be built with state aid are to be surveyed, planned, constructed and maintained by the state, the county paying for a part of the construction not to exceed 50%.

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*Committee report presented at the 17th annual convention of the American Road Builders' Association, Louisville, Ky., Feb. 9-13, 1920. Committee: T. Warren Allen, General Inspector, Bureau of Public Roads, U. S. Department of Agriculture, Chairman; W. R. Neel, Chief Engineer, Georgia State Highway Department; R. L. Saunders, Deputy State Highway Commissioner of Connecticut; Ira R. Browning, State Road Engineer of Utah; A. W. Graham, State Highway Engineer of Missouri; M. W. Watson, State Highway Engineer of Kansas.

Texas

1917 Procedure: The state rendered financial aid to the counties for the construction of roads and bridges.

Ordinarily the state paid one-fourth of the cost of the construction, but under certain conditions it might pay as much as one-half of the estimated total cost.

Surveys, plans, etc. were made under the direction of the county engineer or by a representative of the State Highway Department, detailed at county expense.

Frequent inspections during construction were made by representatives of the State Highway Department.

State aid roads were maintained by the county in accordance with rules and regulations of the state highway engineer. Failure by the county to satisfactorily maintain the roads would result in the withholding of future state allotments.

Changes by Legislation since 1917: There have been no changes in the procedure as outlined for 1917.

Utah

1917 Procedure: The state rendered financial aid to the counties for the construction of roads and bridges.

The state aid roads were constructed at joint state and county expense, the funds subscribed by the county being fixed by agreement in each case. State funds for road construction aid were allotted to the counties on the basis of property value and other factors.

Surveys, plans, etc. were made under the supervision of the state road engineer, and construction was also under the supervision of the state road engineer.

After completion, state aid roads were maintained by the State Road Commission, with state and county funds, in the same proportion as for construction.

Changes by Legislation since 1917: There have been no changes in state aid procedure since 1917.

Vermont

1917 Procedure: The state rendered financial aid to towns for the construction of roads and bridges.

The amount of aid granted to any one town varied from $100 to not more than $1,000 annually, provided the town contributed an equal amount.

Surveys, plans, etc. were made under the direction of the state highway commissioner and bore his approval.

The construction was supervised by a district highway commissioner or by an engineer inspector detailed by the state highway commissioner.

Mintenance of state aid roads was effected at the joint expense of state and town by patrolmen employed by the state under the supervision of the district highway commissioner, in accordance with rules and regulations issued by the state highway commissioner.

Changes by Legislation since 1917: The 1919 legislation sets aside $75,000 of the net motor vehicle funds to be used by the state highway commissioner in assisting towns in the maintenance and improvement of highways other than state roads. The balance of the net motor vehicle funds are to be used for the repair and maintenance of main thoroughfares and state roads. All such money is to be expended under the supervision and direction of the state highway commissioner. The apportionment of the funds to the several counties is to be made in accordance with rules and regulations laid down by the state highway commissioner.

Virginia

1917 Procedure: The state rendered financial aid to the counties in the construction of roads and bridges.

State funds were apportioned to counties not receiving convict labor aid, in proportion to the amount of state tax paid by each county. Convict labor was apportioned to the counties in order of their application, provided that counties could not secure such service for longer than five years if other counties desiring this form of aid were unsupplied.

Surveys, plans, etc. were made by or under the supervision of the state highway commissioner and submitted to the county board for inspection and approval.

Supervision of construction was by an assistant engineer detailed by the state highway commissioner. The expense was paid from a special fund of 5% of the joint funds available for the work.

State aid roads were maintained by the county at county expense, though the state highway commissioner might allot, and in a few instances had allotted, state funds for that purpose.

Changes by Legislation since 1917. No change affecting the method of state aid has been made.

Washington

1917 Procedure: The state rendered financial aid to the counties for road and bridge construction.

So-called "permanent highways," controlled by the state, were paid for either entirely from the "permanent highway fund" or, if the improvement were initiated by the owners of property abutting on the road, these and adjacent owners were required to pay not less than 15% of the cost, the amount assigned to each property owner varying according to the distance of his land from the highway. The "permanent highway fund," which was collected by means of taxation, was expended in the various counties in the ratio in which it was collected.

Surveys, plans, etc. were made by the county engineer, at county expense, subject to the approval of the state highway commissioner.

Construction was supervised by the county engineer, subject to inspection and approval by the state highway commissioner before final payment.

Roads were maintained by the county with the "county permanent highway maintenance fund" which is composed of 5% of the "permanent highway fund" alloted to the county by the state and the proceeds of the motor vehicle licenses, fees, funds, etc. collected within the coutny.

Changes by Legislation since 1917: The 1919 legislation provides for a state system of trunk line highways to be constructed and maintained entirely by the state. This legislation is to be submitted to the people for ratification in November, 1920. If it is ratified, the net motor vehicle revenues will thereafter be placed in a fund to be known as the "state trunk line highway bond redemption fund" to pay the interest and provide a sinking fund for the retirement of state funds for trunk line highway work. It is provided that if the net motor vehicle funds be more than sufficient to pay the interest and provide a sinking fund, the balance shall be deposited in a fund to be known as the "state trunk line highway maintenance fund" for the maintenance of state trunk line highways. If the net motor vehicle funds are more than sufficient to provide for both of these purposes, then the balance is to be distributed to the counties for the maintenance of primary highways at the rate of $200 per mile of primary highway in each county, and if there is still a balance it is to be apportioned to the various counties in proportion to the amount paid in to the "permanen highway fund" by each county and placed in the "permanent highway maintenance fund." The foregoing

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Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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LIGHTS FOR ALL VEHICLES

The safety of the citizen using the public highway depends very largely upon himself, for almost any passable road can be traversed safely if sufficient care is exercised. At the same time, those who walk or ride are entitled to all of the outside protection that can be given them at a reasonable cost and without unduly circumscribing the rights of others.

This safeguarding of traffic is accomplished chiefly by the proper construction and upkeep of the roads and by the passage and enforcement of laws regulating the use of the roads. Neither is sufficient of itself, nor are both adequate without the cooperation of road users.

Night driving involves most of the day-time risks of the road and some others that are peculiar to the dark, and in order to reduce the latter to the minimum, most states have enacted rather elaborate and sometimes quite strict laws relative to lights on motor vehicles. Provision is also made for the carrying lights on horse-drawn vehicles, though certain types are sometimes unwisely exempted.

As a rule, the operator of a motor-driven vehicle voluntarily and cheerfully obeys the lighting laws. If he doesn't he is generally made to. Drivers of horse-drawn vehicles, on the other hand, are less apt to observe the regulations applying to them. And these regulations are usually less vigorously enforced than are those relating to motor-driven vehicles, probably in part because much of such traffic is over roads that are not policed.

These unlighted horse-drawn vehicles are very real sources of danger—as every automobilist well knows. For their own protection, as well as for the sake of other road users, the drivers of wagons and carriages should carry a light that can be seen at a reasonable distance. Where there are no laws providing for the lighting of horse-drawn vehicles the necessary measures should be enacted at once. And the existing regulations should be enforced quite as thoroughly as are those applying to motor cars and trucks.

POLITICS IN ROAD BUILDING

In all the history of road work there has never been an instance in which the injection of politics into questions of highway policy worked anything but harm.

Road improvement is public work and because it is public work it will probably never be wholly free from political interference. At the same time, every effort ought to be made to hold political meddling with the affairs of highway departments down to the minimum. Honest road officials—and that means the big majority of those now in office—realize that fact, and it ought to be possible to bring the general public to a realization of it also.

The enormous sums being expended in road work and the even larger sums likely to be spent in the future will naturally attract the attention of the professional politicians who are in the game for what there is in it. So far, the administration of road work in the several states has been particularly free from the suspicion of graft. It can be kept so if engineers and contractors will set themselves firmly against the politicians.

AESTHETICS IN HIGHWAY DESIGN

Although the fundamental principle of engineering is that any engineering work—be it a bridge, a building or a road—should be so designed as to render the maximum service at the minimum cost, there is no reason why engineers should not give some weight to the appearance of the finished structure.

The desirability of designing for aesthetic as well as ultiltarian features is nowhere greater than in the planning of roads and streets. A building or a bridge covers comparatively little area and, even if not hidden by other neighboring structures, can be seen, as a rule, from a relatively short distance. A highway, on the contrary, extends across the country for mile after mile and is a definite part of the landscape—to those passing over it perhaps the most conspicuous part.

Many of the users of the roads use them for recreation and pleasure. To these the appearance of the road is of more than a little moment, and their number is large enough to warrant their being considered by the designer.

The plea that roads be designed with some regard to appearance, even beautification, is not a plea that they be built and maintained with the same regard for beauty that is manifested in the building and upkeep of roads in parks and cemeteries and private estates where the end sought is looks quite as much as use. But even when utility is the chief end, it is possible to secure beauty also, and at a cost that is not prohibitive. It costs little more to build a road with pleasing curves than it does to build one with monotonously long tangents, nor is it a waste of money to trim rough slopes and provide guard-rails that add to the appearance as well as to the safety of the highway.

Similar principles are equally applicable to the building of bridges. A graceful structure that harmonizes with the surroundings is seldom any more expensive than an ugly one that spoils the appearance of the country so long as it remains within sight.

By taking thought it is generally possible to secure pleasing appearance without appreciably adding to the cost of construction and without sacrificing utility in any way.

Traffic Increase on New York Highways

Figures showing the increase in motor traffic on the highways of New York State during the years 1909 to 1919, were presented by State Highway Commissioner Greene at a recent public hearing on the proposed interstate vehicular tunnel.

On the Albany Post Road at Peekskill there was an increase of 2,710% in motor traffic and on the same road at Albany an increase of 2,688% in motor traffic. In the three-year period from 1916 to 1919, motor truck traffic on the Boston Post Road from Mamaroneck to New Rochelle showed an increase of 387%, being the maximum increase at six points under observation.

Highway Work in Tennessee

Surveys Completed for 447 Miles of Federal Aid Projects and Contracts for 109 Miles Approved in 1919 Will Be Let This Year

The highway program in Tennessee for 1920 embraces work in over 30 counties for which the surveys totaling 447 mi. have been completed. All of this new work is on federal aid roads and contracts will be let after the approval of the plans. It is planned to build 230 mi. of bituminous macadam at a cost of $25,000 per mile; 191 mi. of water-bound macadam at an estimated cost of $15,000 per mile and 25 mi. of one-course concrete pavement at an estimated cost of $35,000 per mile. The total cost of these projects is estimated to be $9,518,100.

On state aid roads there are 40 mi. now under contract at an estimated cost of $325,898, of which $182,438 had been spent prior to Jan. 1, 1920, leaving a balance of $143,460 to be expended during this year.

Last year 220 mi. of federal aid roads were approved and 111 mi. were let during 1919 at a total cost of $1,709,006. There has been paid to contractors the sum of $165,715, leaving a balance of $1,543,291 to be expended on federal aid contracts let in 1919.

The remaining 109 mi. of federal aid projects approved last year and not let to contract have been advertised and are expected to soon be under construction. It is estimated that this work will cost $1,600,000, with an additional sum of $190,000 for the construction of necessary bridges.

Status of State Aid to Counties and its Future Development

(Concluded from page 220)

will supersede the present scheme in regard to the use of net motor vehicle funds. It is also provided that any county which has constructed a part of the trunk line highway system with county funds, according to the standards required by the act, shall be reimbursed the amount estimated to be the value of the construction, not exceeding the actual cost thereof paid by the county.

West Virginia

1917 Procedure: The state extended financial aid to the counties for road and bridge construction.

State highway funds available were apportioned among the counties in the ratio of Class A mileage in each county conditioned on the provision of an equal amount by the counties.

Surveys, plans, etc. were made by and at the expense of the county and approved by the State Road Commission.

Construction was carried on by the county, subject to the supervision of the State Road Commission or its authorized agent.

Roads constructed with joint funds were maintained by the county with county funds, subject to inspection by the State Road Commission, which might withhold future allotments if maintenance were not satisfactorily executed by the county.

Changes by Legislation since 1917: The 1919 legislation provides that under certain conditions the allotment accruing to a county may be spent as the State Road Commission may direct, and under such conditions the amount paid by the state may exceed 50% of the cost of construction.

Wisconsin

1917 Procedure: The state granted money aid to the counties for road and bridge construction.

Counties were required to expend 50% of their annual allotment of state aid on state trunk highways, providing an equal sum from county funds, though it was provided that counties might levy not over 40% of their share upon the interested towns within the county. When the county and state only were interested in the cooperation, the state's portion of the cost of construction was limited to 40%. When the county and town shared the balance of the cost the state's portion was limited to 33⅓%. Aid was granted for for two classes of highways designated as "state trunk highways" and "county prospective state highways."

The "state trunk highways" were surveyed, planned, etc. by the State Highway Commission. "County prospective state highways" were planned, etc. by the county, subject to the approval of the State Highway Commission.

State highways were constructed under the supervision of the State Highway Commission. "County prospective state highways" were constructed under the supervision of the county, though upon the request of the county, the Highway Commission would assign an engineer.

"State trunk highways" were maintained by the county, with county funds, according to instructions and under the supervision of the State Highway Commission, the state reimbursing the whole or part of the cost of such maintenance from the net motor vehcle funds. "County prospective state highways" were maintained by the county, according to general instructions and under the supervision of the State Highway Commission.

Changes by Legislation since 1917: No material changes have been made since 1917.

Wyoming

1917 Procedure: The state granted money aid to the counties for road and bridge construction.

State and county shared equally the estimated cost of construction. In addition, state convicts might be employed if available and if requested by the county board of commissioners. In such case, the county was required to furnish tools and materials and pay the salary of the engineer and the additional salaries of the guards, if such additional salaries were required.

Surveys, plans, etc. were made by the state highway engineer and the construction was suprvised by him.

State aid roads were maintained by the county, subject to the supervision of the state highway officials.

Changes by Legislation since 1917: The 1919 legislation provides for the appointment of a state highway superintendent to replace the state highway engineer, and in addition to the powers of the former state highway engineer the new official is authorized to furnish plans, specifications, etc. for roads upon the request of the counties and to give advice on road matters. It is also required that he shall furnish plans and specifications for all bridges constructed within the state the cost of which exceeds $1,000, and no payment for such a bridge is permitted to be made without the approval of the state highway superintendent.

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Announcement

This section of the paper is open to members of the Massachusetts Highway Association for the discussion of matters directly connected with road interests. Members are requested to submit items of interest for use in this column.

Address all communications to GOOD ROADS, P. O. Box 2705, Boston.

News and Gossip

On June 29 a new law will go into effect in Massachusetts, which establishes the right of way on all streets and roads, except in such places as are under the control of a traffic officer. By this law, which was recently passed by the Legislature, when two vehicles approach a street or road intersection at approximately the same instant the vehicle approaching from the right is to have the right of way.

It is believed that this law will aid materially in diminishing the number of collisions. Furthermore, by settling which driver has the right of way, it will aid in fixing the responsibility for accidents. Once the law is well understood, a driver will have to watch only the vehicles that are approaching him from the right.

A law of this kind has been sought for several years, but has not been passed, because it was thought that one could not be drawn that would be applicable to all situations. This law, however, seems to provide for every contingency in a simple manner. The bill was introduced by Representative John A. White of North Brookfield and was modelled after laws of similar character in Connecticut and New Jersey. The law reads as follows:

"Every driver of a motor or other vehicle approaching an intersecting way, as defined in section 1 of chapter 534 of the acts of 1909, shall grant the right of way at the point of intersection to vehicles approaching from his right, provided that such vehicles are arriving at the point of intersection at approximately the same instant; except that whenever traffic officers are standing at such intersections, they shall have the right to regulate traffic thereat."

Commissioner John N. Cole of the State Department of Public Works gave the motor truck owners much encouragement of better conditions on the main routes of highway travel next winter than have existed this year in a talk before the Motor Truck Club of Massachusetts. He said that for the state to engage in the removal of snow from the main routes, so as to keep them in good shape for motor vehicles, would be a most expensive undertaking, estimating that it would take 10% of the motor vehicle fees to keep 10% of the roads open 10% of the time. He said, however, that he was considering a plan whereby the state would furnish snow removal equipment, such as plows, which can be attached to motor trucks, and that if the trucking interests would supply the trucks the state would supply the equipment, and in this way the roads could be broken out on a cooperative basis at not excessive cost. This suggestion met with much favor among the truck men, who have been greatly handicapped this winter by the condition of the roads.

Lieut. Bernard J. Hoppe, head of the Boston police traffic squad, also addressed the truck men briefly. He urged that they take greater interest in promoting street improvements in Boston, such as much-neded widenings and better pavements. The vehicle interests, he said, are vitally interested in these matters and yet they rarely appear to advocate them before the authorities in charge of such things.

A third speaker was James H. Devlin, Secretary to Police Commissioner Curtis, who said that the commissioner would be glad to confer with the trucking interests in regard to traffic matters. Edwin C. Stone told the members of the club about bills before the Legislature that bear upon motor vehicle insurance.

The Motor Truck Club, though organized only a short time ago, is a very live body and is growing rapidly. The club held a banquet on Tuesday evening, Mar. 16, during the automobile show.

At the recent opening of bids for road oils in Lowell the results gave some indication of the difficulty that cities and towns everywhere will experience in securing oil products for road work. Jacob Renton, a Standard Oil Co. representative, who has always been most active in the interest of his company in the past, simply said that the company cuold do a lot better by selling for fuel purposes

The Gulf Refining Co., also refused to enter a bid.

The Alden Spear's Co., of Boston, did bid, however. The company has on one or two occasions supplied its asphaltic oil to the city, and of the three bidders it was the only one which submitted a certified check for $1,000 to the purchasing agent.

The call was to supply 140,000 gal., more or less, of 45 to 65% asphaltic oil for road building purposes. On the 45% oil the Alden Spear's Co. bid 13.95 ct. a gallon, and on the 65% asphaltic oil the bid was 14.95 ct. a gallon. This price includes the cost of application of the oil.

Joseph J. Galvin, of Boston, bid on several grades of oil. On the 25 to 30%, his bid was 12 ct., and the same on the 45, 65 and 70%. However, he wanted 1¾ ct. a gallon for spreading the oil.

The Eastern Good Roads Co., of Boston, bid to supply 30% asphaltic road oil at 12 ct. a gallon.

Boston has been threatened with a strike of city employees, for at a meeting of employees of the water, sewer, sanitary, paving and street cleaning divisions of the Public Works Department of the city, held recently at 995 Washington St., it was voted by an overwhelming majority to authorize the executive board of Local 149, International Teamster's Union, with which they are affiliated, to request sanction from the International body to poll a strike vote.

It is believed from the statements of leaders, that if the sanction is given, the employees will take a strike vote as soon as it becomes certain beyond a doubt that the city budget will not make provision for their demands of a wage increase of $1 a day. Their present wage is $4, and Mayor Peters in his budget has made allowance for a wage of $4.50 a day.

An effort is being made to ascertain whether the international union has granted strike sanction in Chicago. It is claimed that that city is tied up, and this city, leaders say, will face the same situation unless the increase is granted.

The threatened strike would affect 2,600 men, all members of City Employees' Union, Local 149, and would result in practically a complete tie-up of the city water system, public buildings and all other public works.

The State Department of Public Works is planning to rebuild the main road from Orleans to Provincetown some time this summer. The road extends the whole length of the forearm of the Cape, and will be one of the longest pieces of road building the state has attempted at one time.

At present the road between Boston and Orleans is from 12 to 15 ft. wide, and is in bad condition. Under the new plans the road will be rebuilt to a width of 18 ft. all the way, with wide and easy curves. The sand and oil type of road will be built, as it has proved so satisfactory on the Cape. Nothing definite has been learned as to when the work will start.

Halsey A. Weaver, of Quincy, who has been appointed commissioner of public works of the Granite City by Mayor Joseph L. Whiton, is widely known in civil engineering circles. He will succeed Moses L. Brown, whose term expired several weeks ago.

Mr. Weaver is a native of Worcester, but has been a resdient of Quincy for eight years. After receiving preliminary education in the public schools of Worcester and Worcester Academy he entered the Sheffield Scientific School, of Yale University, from which he was graduated in 1895 with the degree of Ph. B. He is a veteran of the Spanish-American war, in which he served as a member of the engineering corps.

After being msutered out of the service he became a division engineer on the New York, New Haven & Hartford Railroad, and had charge of the New York-Boston division, having supervision of the tracks, bridges, buildings and signals. He filled his position for 15 years, when he resigned to accept a position as engineer of the Park Department of the City of Boston, where he remained for two years. Since that time he has had charge of large municipal contracts for various cities under private contractors. He was also the head of the civil service listing on Grade D, Engineers.

Mr. Weaver is married and has a wife and one son and lives at 28 Channing Street, Norfolk Downs, Quincy.

Watertown's spirited fight for chairmanship of the selectmen has ended in the election of Charles H. Abbott, who presided at the first meeting of the newly-organized board. In view of the chairmanship battle, keen interest is being shown in the assignments of town departments.

But one assignment has thus far been made, that of Chairman Abbott, to have charge of the highway department. G. Frederick Robinson and Ernest K. Ingalls, the other members of the board, will be given departments tonight.

Although Abbott, as high man in the election, nominally was entitled to the chairmanship, a hot contest developed, ending in his victory over Robinson.

When the report was circulated that President Wilson would occupy the Crane Estate at Woods Hole, William J. Ring, foreman of the road gang for this section of Falmouth, determined that at least the highways under his care would be in first-class condition.

Mr. Ring is a well known character on the Cape and only a short time ago he celebrated his 81st birthday and we think that this gives him the distinction of being the oldest active road builder in the country. He is still hale and hearty and is on the job every day, superintending his gang.

When Bill Ring, as his friends call him, first came to the Cape the houses were few and far between and there was but one main highway in the whole section.

We are sure that Mr. Ring will be greatly disappointed now that the President has been obliged to change his plans.

Damage to Connecticut's system of highways by motor truck traffic the past winter and this spring has been very heavy, according to State Highway Commissioner C. J. Bennett. In a letter to manufacturers, he asked shippers to restrict the maximum load on motor trucks to the legal limit of 25,000 lb., and during the spring to include the truck in a limit of 8 tons.

Motor traffic between industrial centers in Connecticut and New York City, Boston and Providence, has reached great proportions. The through traffic from New York and points beyond to Boston, begun during the war because of railroad conditions, is so large and loads so heavy that the state's present trunk highway construction may not long stand up under it.

Tree branches projecting over a public highway constitute a defect for which cities and towns are liable for damage or injury resulting therefrom, according to a decision today by the full bench of the Massachusetts Supreme Court in the suit of the Valvoline Oil Co. against the Town of Winthrop for damages to the top of an oil wagon in June, 1918, on Herman Street, Winthrop, which it was charged occurred when the wagon had to take the side of the road to pass an automobile. In the municipal court the case had been decided in favor of the town, but was appealed to the Supreme Court by the company. The damage award was $91.19.

This is a decision regarded with vital interest by cities and towns throughout the state, and may result in the clearing of a number of historic trees.

The tree in this case was 50 years old.

After listening to an address by Mayor Benjamin F. Haines, the city laborers of Medford at a union meeting, voted to accept an increase of 25 ct. which the Medford Board of Aldermen had voted them. The mayor promised to secure for the men another raise of 10 ct. The wage will be $4.25, an increase from $4 .

One of the largest bonds executed in Massachusetts for several years is for $1,000,000 and has just been written by the Fidelity and Deposit Co. of Maryland for H. P. Converse & Co., Boston, as a guarantee that the firm will complete its $3,255,000 contract to build a concrete and steel bridge over the Connecticut River at Springfield. This bridge is to be for general traffic purposes and the contract calls for its being ready for use in 2½ years.

The bond, which carries a premium of nearly $50,000, was placed through the Boston representatives of the Fidelity, Arthur L. Pash and W. W. Hoblitzell. It passes to the Hampden County Commissioners.

The members of the salary and ordinance committees of the Malden City Council at a joint meeting voted to consolidate the offices of the Board of Health and the Street and Water Departments under one head and to recommend that after two months the salary of the city comptroller be increased from $2,000 to $2,500.

Following consistent demands by Boston property owners along Tremont Street between Dover and Northampton, the

Public Works Department, with the approval of the Mayor, has agreed to lay granolithic sidewalks in the section instead of brick. The total cost of the job will be $19,245, or 27 ct. per square foot of concrete, base and wearing surface, furnished and laid with a 5-year maintenance guarantee. The B. E. Grant Co. is doing the work.

One of the main features of "Ship-by-Truck Week" that is to be observed in Massachusetts during the week of May 17 will be a parade of commercial motor vehicles that will be representative of practically every type of truck and delivery vehicle in common use in this section. At a meeting of the general committee in the Firestone Tire Building on Beacon Street, the run was discussed and the project met with so much favor that most of the truck dealers in the city agreed to enter vehicles.

A delegation from Worcester was present and requested that the itinerary of the run be so arranged as to pass through their city. They said they would have a parade of trucks from Worcester to meet the big parade and escort it into the city, where they hoped it could remain for a day. It is the plan to visit the principal cities of the state on the run; also the agricultural sections, to show farmers the great possibilities of the motor truck in shipping their produce to market.

Col. Theodore Baker, who was head of the transport service of the First Army, A. E. F., during the Argonne offensive, will have command of the truck parade. A schedule will be worked out for each day of the run and announcement will be made in advance as to where the trucks can be seen. There will be gasoline tank wagons and repair trucks along, and the whole convoy will be practically self-supporting so far as the vehicles are concerned.

Day Baker is general chairman of the committee in charge of the run and he is completing his committees and making other preparations for "Ship-by-Truck Week."

The city purchasing agent, George J. Cronin, has advised Mayor Peters to reject the bid of the American Oil Products Co. for furnishing road oil to the city, on the ground the bid did not comply with the city's specifications. This is the same company that furnished oil to the city last year under a contract which was investigated by the Finance Commission, and which resulted in the removal of the former purchasing agent, Thomas J. Dawson.

According to Mr. Cronin, the company's bid for this year's oil was 11.65 ct. a gallon, the lowest received, but in submitting this price the company tore the city specifications from the usual contract form and substituted its own conditions and submitted a sample of the oil it proposed to furnish.

Mr. Cronin advised awarding this year's contract to the Alden Spear's Sons Co., whose bid was 16½ ct. a gallon for 96,000 gal. Mr. Cronin had advertised for bids on 450,000 gal., but this bidder was unable, because of the present oil shortage, to contract to furnish more than 96,000 gal. Bids for the rest of the quantity needed will be advertised later.

New Hampshire Goods Roads Association

OFFICERS FOR 1920

WINFRED M. CHAPLIN, President	Keene
WM. J. MORRISON, Secretary and Treasurer	Keene
HARRY L. SMITH, First Vice President	Lakeport
OZMAN W. FERNALD, Second Vice President	Berlin

Board of Directors

WILLIAM A. GROVER	Dover
H. W. SPAULDING	Manchester

The daylight saving law of Massachusetts which went into effect on April 25 has indirectly caused a commotion in New Hampshire due to the fact that the Boston & Maine Railroad has issued notices that it will change its train schedules to conform with the Masachusetts time.

For the benefit of the road workers we print the statement issued by the master of the New Hampshire State Grange.

"Whereas the 'Daylight Wasting Law' is to be effective in our neighboring state, Massachusetts, on April 25, the Boston & Maine Railroad has served notice that it will change its time, starting all trains one hour earlier until October 31, without regard to the greatest and by far the most important industry, that of agriculture, which furnishes much business and which is today in the most dangerous condition in the history of our lives.

"The damage to this farming business, if it is obliged to adopt this new daylight time, will be so great that it cannot be estimated. I have talked with dairymen in many parts of New Hampshire and they are planning to give up the business of shipping milk.

"Everyone ought to know that six months, during the winter, the dairyman has to work from one to two hours before light in order to deliver his milk to the early morning trains so that it will reach the city trade. Do you expect that these men who furnish this milk are going to continue in this most necessary food production business when they must do their milking before daylight the year through, while their city friends are having this same hour to sleep?

"We hear a great deal about the high cost of living, but the farmers have come to the conclusion that the consuming public is willing to have prices go higher, for every little while some change is being made to make farming more difficult.

"Does the public know that the farmers of New Hampshire are short about 4,800 men for their business this year? Does the public know that herd after herd of cattle, which the farmers have been building up and improving for 25 years, is being sold and the owner is letting his farm go while he works at something other than producing food, because he can get such high wages for so few hours of labor."

On account of the serious damage done to state roads each year at this season, State Engineer Everett issued the following statement:

"To selectmen, road agents and patrolmen in all towns within the state of New Hampshire, wherein are located any part of the state roads, state aid or trunk line highways: Gentlemen:

"The operation of any vehicle which together with its load shall exceed three tons in weight upon any of the state road, state aid or trunk line highways within the state during the period that the frost is coming out of the ground, that is, between the date hereof and the 20th day of April, 1920, will be regarded as unlawful and any injury to such roads or highways caused thereby will be regarded as willful injury.

"You are hereby requested and directed to caution all owners, drivers and operators of such vehicles, informing them of this order and reporting to this department any and all violations thereof.

"All such owners, drivers and operators will be prosecuted for a viclation hereof, and in addition thereto be held libale for any injury caused therefrom."

There has been considerable damage to the Henniker Road in Hillsborough from the high water in the Contoocook River.

At some points the highways were flooded to a depth of 5 ft.

New London and Newbury, bordering on Sunapee Lake, have by direct vote to raise by taxation and bond issue, to meet state and Federal Government aid, made available nearly $250,000 for improved roads, each town doing its equal share.

Not all of the money will be expended during 1920, on account of high prices and scarcity of labor, although a beginning will be made and the work continued under state supervision until Lake Sunapee will be widely known for its good roads.

On March 30 there was a hearing in the superior court regarding the laying out of the new highway in Exeter in front of the Thompson Gymnasium and closing of the street approaching Gilman Park. It was agreed by the counsel that Phillips-Exeter Academy should proceed to lay out the new highway, making a semi-circle from Court Street. The matter of closing the road to the park is to be left to the voters at the next town meeting.

Bids were recently opened at the State Highway Commission's office for 1.5 mi. of modified concrete highway on the Manchester-Concord trunk line. The lowest bid was that of Winslow & Cummings, of Nashua, whose figures were $18,730.10. The other bidders and their figures were: The Robie Consolidated Concrete Co., of Manchester, $19,199.50; Thomas Murphy, of Keene, $21,343.60; Framingham Construction & Supply Co., of Framingham, Mass., $22,663.75; Vogel & Handley, of Manchester, $30,160.20. The bid upon which will be awarded the contract must be approved by the governor and council before the State Highway Department can proceed with the work.

The piece of road in question starts at the Manchester line and runs north a distance of 1.5 mi. to the point on the highway which has been resurfaced. It is expected that the governor and council will approve the bid of the Nashua contractor and that work can be started within a few weeks. This stretch of highway, though short, is badly in need of attention and is an annoyance to drivers of automobiles.

The type of roadway called for in the contract which the successful bidder must sign is said to be found highly satisfactory for heavy traffic.

The Amoskeag Company is actively preparing for the erection of its new 1000-ft. dam across the Merrimack at Manchester. On the island opposite the hosiery mill they have provided a stone-crusher, blacksmith shop, tool house and other necessary equipment so that work can be started as soon as the spring freshets are over.

The proposed Portland to Portland transcontinental highway should be of great interest to all citizens of New Hampshire. The promoters of the plan call the road the Theodore Roosevelt International Highway. It begins at Portland, Maine, on the Atlantic, and ends at Portland, Oregon, on the Pacific. It will follow closely the international boundary between the United States and Canada, its greatest mileage being within the United States from which it departs for a few hundred miles while crossing the extreme southern portion of the province of Ontario, north of Lake Erie.

Of all of the trancontinental highways already established or now in the making, it is the one really northern route and it will carry its travelers into and through nearly every type of country in the United States, with the exception of the swamps and near-tropical forests of the South.

With some possible future changes, which will not affect the general route in any way, the line of the highway has now been definitely adopted from beginning to end over generally traveled state and county roads; and although hundreds of miles of these roads, especially through the Northwest, are yet dirt surfaced, it is the belief of the officers of the association that coming years will see it develop into a national highway of permanent construction.

At the town meeting in Concord on April 13, the budget for 1920 as passed amounted to $160,000.

A strike of quarrymen at West Concord ended on April 14. About 150 men had been out for nine days.

The engineers who have also been out were granted their demand of 74 ct. an hour.

The conditions in regard to the cutters remain unchanged, but they look for an early adjustment, following the return of the engineers and quarrymen.

A recent decision of Chief Justice Kivel of the Superior Court, rendered on April 14, should be of interest to city officials.

Mayor Moise Verrette dismissed two commissioners of the Board of Public Works of the City of Manchester and on suit for reinstatement the court decided that "The evidence was insufficient to sustain the charges alleged against the petitioners and rules that the defendants' proceedings, including the action of the Mayor in removing the petitioners from office were illegal for want of jurisdiction."

Despite the decision of the Superior Court declaring that the mayor exceeded his powers and authority in removing Commissioners George H. Warren and John P. Kirby of the Department of Public Works, Mayor Verette has refused to authorize the payment of the salaries of the two officials.

In the payroll of the Department of Public Works, Mayor Verrette blue penciled the names of George H. Warren, Commissioner, John P. Kirby, Commissioner and Michael F. Shea, Director, when the payroll was submitted for his approval.

This fact was confirmed by City Treasurer Allison Partridge, when he said he was forbidden to pay the salaries of the three officials of the Department of Public Works mentioned above.

Director Michael F. Shea has received no salary from the city since last December. Mayor Verette still refuses to recognize the head of the city's largest department and consequently the director has not received a cent of salary since his appointment by the Public Works Commission last December.

At a meeting of the Keene City Council on April 15, a bond issue of $25,000 was voted for a new bridge across the Ashuelot River at Island Street. The new structure will replace a light steel bridge erected in 1877.

At the same meeting an appropriation was made for cement concrete pavement on a part of Court Street, and $10,000 was appropriated for new motor apparatus for the Fire Department.

Merton C. Knapp, who was inspector on Federal Aid Project No. 59 at Fitzwilliam last year has been promoted to assistant engineer and assigned as assistant to Division Engineer F. W. Brown of Division 5.

Capt. John B. Wright, Assistant Engineer attached to

Division No. 4, has taken the position of town manager for the manufacturing town of Springfield, Vermont.

Federal Aid Project No. 2 at Marlboro has recently been completed.

Federal Aid Project No. 97 at Fitzwilliam is to be let in the near future. It is about 1 mi. of bituminous macadam.

Work has recently been resumed on Federal Aid Project No. 48 at Walpole.

Arthur M. Russell has a position this season in the maintenance work of Division 4.

Fred W. Huntley of Charlestown, N. H., is maintenance foreman with Engineer C. P. Riford of Division 3 and plans to do extensive work on the West Side and Central Roads in the vinicity of Newport and Lake Sunapee.

The unuually heavy snow blanket of the past winter appears to have been beneficial to the gravel roads of southwestern New Hampshire, as the roads are in particularly good condition this spring.

New York State Road Builders' Association

OFFICERS

JOHN H. GORDON, President	Albany
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Crusher Run

At the annual election of the New York State Road Builders' Association, which took place at the rooms of the Association on Thursday, Mar. 18, 1920, the following officers were elected for the year 1920: President, John H. Gordon, Albany, N. Y.; Vice President, C. J. Hendrickson, Syracuse, N. Y.; trustees to serve three years, Fred E. Ellis, Melrose, Mass.; W. T. Thayer, Chateaugay, N. Y.

The election of John H. Gordon to the presidency of the New York State Road Builders' Association, marks his sixth term of office. Mr. Gordon has always been one of the leading spirits in the Association since its organization, and the several terms that he has served as its president have been signalized by the most successful achievemnt. The number of times that he has been reelected to the office demonstrates that the members appreciate his good work.

Governor Smith's signature to the bill appropriating $630,000 for the construction of the bridge over Rondout Creek at Kingston was followed by Commissioner Greene's announcement that he would have the bridge open for traffic on July 4, 1921. He also predicted that the Storm King Road would be completed for traffic early in 1922.

The Rondout Bridge and the completion of the Storm King Road, will make one of the finest motor thoroughfares in the state. Present conditions necessitate carrying automobiles across Rondout Creek on the ferry, two cars at a time, and holiday conditions are serious. Commissioner Greene said that while the ferry was a very interesting relic it did not speak very well for the progressiveness of the state.

The following awards were made at the letting which took place at the New York State Highway Department, on March 18, 1920: Ribstein-Holter Co., Inc., Oswego County Road No. 1553, $64,642.45; Ribstein-Holter Co., Inc., Oswego County Road No. 1554, $127,056.00; Ribstein-Holter Co., Inc., Oswego County Road No. 1551, $93,607.45; Morris C. Soper, Seneca County Road No. 1555, $58,743.00; Ribstein-Holter Co., Inc., Ontario County Road No. 1549, $142,778.40; Hendrickson-McCabe Co., Ontario County Road No. 5655, $36,853.75; F. H. Rhodey, Orleans County Road No. 1429, $168,285.25; Woodcock-Todd Construction Co., St. Lawrence County Road No. 1389, $151,984.50; Ring & McConville, St. Lawrence County Road No. 1547, $176,946.75; Arthur A. McConville, Franklin County Road No. 1383, $84,478.50.

A new highway, to be known as the Beck Corners-Callanan Corner County Highway, will be built at a cost of $163,000, the state paying one-half of the cost, and the county the other half.

Awards amounting to $645,286.65 were made by Commissioner Greene to the Capital City Supply Co., Headley Good Roads Co., Warner-Quinlan Co., and the Barrett Manufacturing Co. These contracts will supply the department with 3,595,850 gal. of tar and asphalt which will be used in repairing state highways.

The Rensselaer County Board of Supervisors has given the preference to the Petersburg-North Petersburg Highway over the Johnsonville-Buskirk and Hoosick-Pittstown Road. The latter road was recommended by Commissioner Greene, and by 500 citizens of the towns of Pittstown, Hoosick and Schaticoke.

The residents of Schoharie County are urging the completion of State Highway Route 38 on the basis of a more complete, direct and available route from Albany and Binghamton to the Catskill resorts. The scenic value of the proposed road is one that is being missed at the present time by tourists.

The following awards were made at the letting which took place at the New York State Highway Department on Friday, April 16: Rossney Contracting Corporation, Cortland County Road No. 1558, $76,873.50; Sweeney & Boland, Livingston County Road No. 1321, $237,534.30; Nathan E. Young, Tioga County Road No. 5657, $51,854.51—Repair Contracts: Wm. L. Sherrill, Saratoga County Road No. 1245, $39,990.70; Jos. J. Malloy, Schenectady County Road No. 1247, $47,641.80; Harry W. Roberts & Co., Oneida County Road No. 1249,

$148,864.75; Nathan E. Young, Broome County Road No. 1232, $15,976.05; Nathan E. Young, Broome County Road No. 1234, $9,956.00;Lane Construction Corp., Sullivan County Road No. 1244, $81,675.74; Tyne & Willy, Cortland County Road No. 1250, $106,501.80; Lane Construction Corp., Oswego County Road No. 1233, $42,739.00; Atlanta Construction Co., Livingston County Road No. 1239, $163,075.10; Hendrickson-McCabe Construction Co., Monroe County Road No. 1237, $49,610.00; Greece Contruction Co., Orleans County Road No. 1238, $71,589.00.

In this letting there were 33 roads advertised; 14 roads were awarded; there were no proposals on 10 roads; 3 were withdrawn from the letting; 1 was rejected, being over the engineer's estimate; and 5 were held.

MEETINGS

Calendar of Coming Meetings

May 10-11—American Association of Engineers.—Annual meeting, St. Louis, Mo. Secretary, A. H. Krom, 63 E. Adams St., Chicago, Ill.

May 13-15—League of Texas Municipalities.—Eighth annual convention, Dallas, Texas. Secretary, Frank M. Stewart, University of Texas, Austin, Texas.

June 1-3.—Canadian Good Roads Association.—Seventh Annual Convention, Winnipeg, Manitoba, Canada. Secretary-treasurer, Geo. A. McNamee, 909 New Birks Bldg., Montreal, P. Q.

PERSONAL MENTION

A. Deleglise has been appointed city engineer of Antigo, Wis.

William Collins has been appointed city engineer of Decatur, Ill.

H. P. Martin has resigned as director of public safety of Dayton, O.

Albert Givan has been appointed assistant state engineer of California.

H. C. Hord has been appointed office engineer of Dallas County, Texas.

Alan K. Hay was recently appointed engineer and secretary of the Ottawa, Canada, Suburban Road Commission.

W. H. Bauma, Omaha, Neb., was recently appointed county highway commissioner and surveyor of Thayer County, Nebraska.

C. S. Heidel, formerly State Hydrographer of Montana, was recently appointed state engineer, succeeding A. M. Mahon.

John H. Ryckman was recently appointed designing engineer of the Department of Public Works of the City of Chicago, Ill.

Fred O. Eichelberger, City Civil Engineer of Dayton, O., has succeeded H. P. Martin as director of public service of that city.

James A. Toner, formerly Assistant City Engineer of Meriden, Conn., was recently appointed superintendent of public works.

R. E. L. Snead has resigned as assistant construction engineer of Dallas County, Texas.

W. J. Savage has been appointed director of sales in the steel form department of the Heltzel Steel Form and Iron Co. of Warren, O.

J. W. Blackmon, formerly City Engineer of New Westminister, B. C., Canada, has succeeded A. M. West as city engineer of North Vancouver.

E. V. Ford has been placed in charge of the Parrish template and finishing machine sales department of the Heltzel Steel Form & Iron Co., of Warren, O.

G. L. Campbell has resigned as county engineer of Saline County, Kansas, to become division engineer of the Kansas State Highway Commission, with headquarters at Saline.

M. C. W. Boyd has resigned his position as general manager of sales with the Heltzel Steel Form & Iron Co., of Warren, Ohio, to become general manager and treasurer of the Good Roads Corporation of Kansas City, Mo. Mr. Boyd retains his interests in the Heltzel Steel Form & Iron Co.

PUBLICATIONS

BALTIMORE COUNTY, MARYLAND. Annual Report of the Roads Engineer for the year ending December 31, 1919. Paper, 6x9 in. 64 pages and covers and insert.

This report consists of tables and summaries of the road work in the several districts of the county performed during the fiscal year and also includes lists of the commissioners of the county for the years 1919 and 1920. An insert tabulating the road machinery owned by Baltimore County is also included.

STATE OF NEW YORK, COMMISSION OF HIGHWAYS. THE HIGHWAY LAW. Laws of 1909, Chapter 30, contituting Chapter 25 of the Consolidated Laws as amended 1910 to 1919, inclusive, and General Highway Traffic Law, Chapter 70 of the Consolidated Laws. Paper, 6x9 in. 348 pages and covers.

This publication contains the consolidated laws on highways and highway traffic up to and including the year 1919. An index to the subject-matter is included at the end of the book, indicating both the section of the law and the page in the book where the matter occurs.

STATE OF NEW YORK, COMMISSIONER OF HIGHWAYS. Report of the State Commissioner of Highways for 1919. Paper, 6x9 in., 16 pages.

This is a brief report of the operations of the State Highway Department during 1919, discussing the condition of the work in the department when the present commissioner took office, the work of construction and maintenance during the year and the construction program for 1920. Commissioner Greene, in this report, recommends a change in the highway law so as to permit the purchase by the state of materials used in road building. He also states that the department suffered a loss of 23% of its staff during 1919 and that a new salary scale is now in force to meet this difficulty.

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GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

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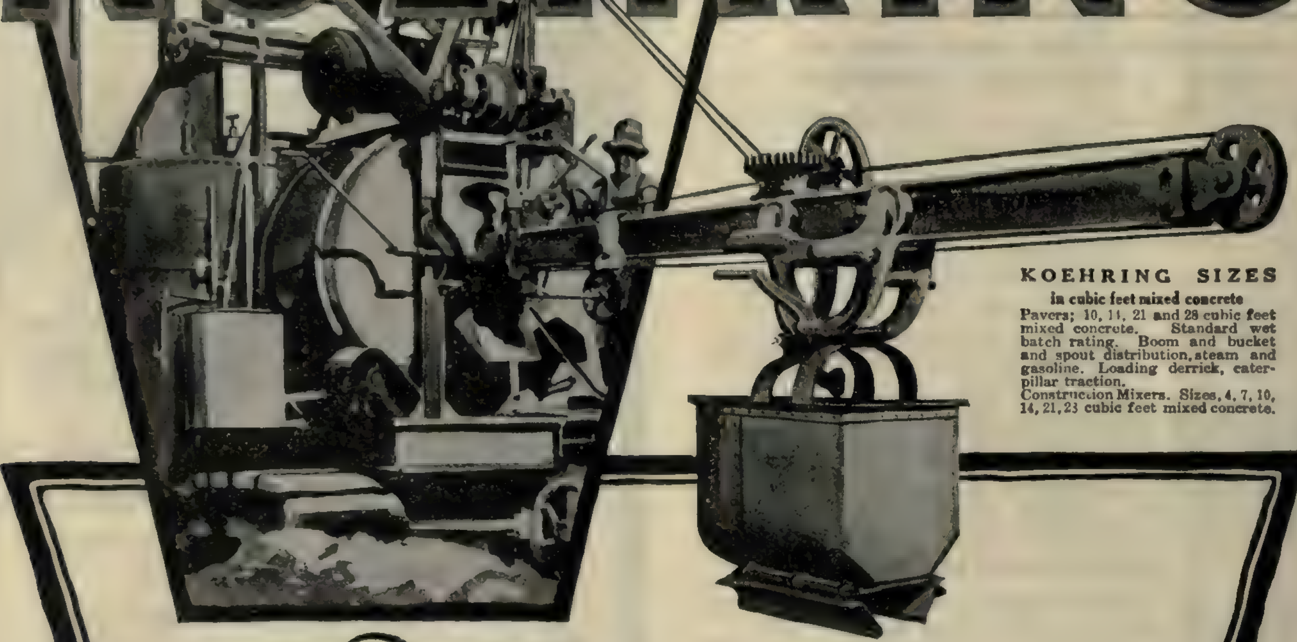

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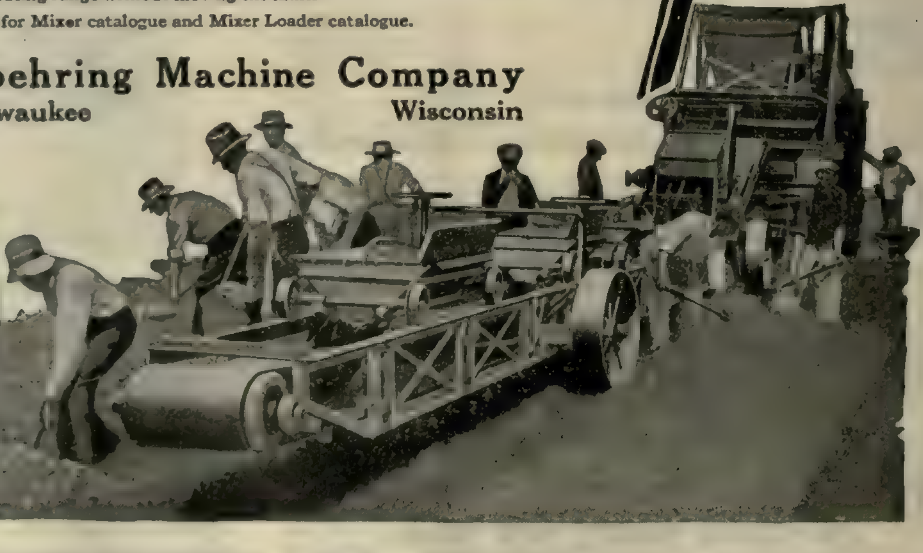


GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

WITH WHICH IS INCORPORATED

THE HIGHWAY CONTRACTOR AND ROAD BUILDER

Old Series, Vol. LVIII
New Series, Vol. XVIV

JAMESTOWN, N. Y., MAY 5, 1920

Number
18

Cost Estimating*

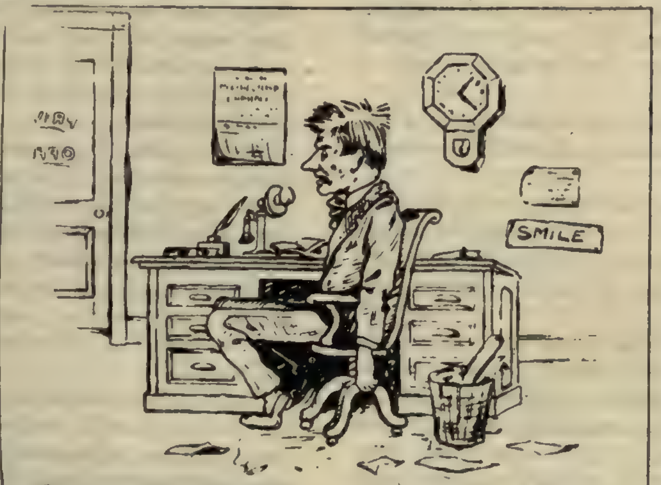
By N. F. HELMERS†

The subject of "Cost Estimating" is of unusually wide scope, as practically each type of contract work has to be analyzed on its own merits and is subject to special consideration. In all cases, however, the following elements enter and must be given consideration: Financial credit; constructive skill; use of plant; hazard; profit.

1. Financial Credit

The contractor should make a carefully prepared schedule of the amount of money which will have to be invested in the proposed work from the time he signs the contract until his final estimate is rendered, and from such schedule he must determine the amount of interest this money will cost, and this amount is a proper charge against the work. If this is not done the contractor is merely contributing to the owner this amount.

Furthermore, a careful analysis along these lines will often discloses the fact that a certain piece of work required a larger amount of money to handle than was apparent at first glance, and such a condition might work hardship if not disaster, on the contractor in spite of the fact that all other considerations had been taken care of. It is a notorious fact that on a certain type of contracts pay for preliminary work, which may be a large item, cannot be secured through the medium of the regular unit prices, until the work has progressed well along to completion



The Successful Bidder — What did I forget??"

2. Constructive Skill

Contractors engaged in business are entitled to receive compensation in the shape of an annual salary for personal services rendered, and it is our belief that any computations of cost should include sufficient amount to cover such salary whether it be that of a single individual or various members of a partnership or corporation. If this is not done the contractor is contributing his services to the owner without renumeration, because by no stretch of the imagination can there be any rightly considered profit except as over and above a reasonable salary allowance to the contractor himself.

3. Use of Plant

This item justifies an independent discussion by itself and we suggest that the association appoint a committee to deal directly with it.

4. Hazard

Many specifications include clauses which contemplate making the contractor assume risks which should properly be borne by the site, or in other words, should be at the owner's risk In making a proposal on such work the contractor has two alternatives—one to protect himself in his proposal against such risks by special provision in his proposal, or secondly, to put a large value on any possible risk which he is asked to stand.

It may be well to add in this connection that while it ordinarily behooves a contractor to be somewhat of an optimist, he can well afford to be a confirmed pessimist when figuring this portion of a contract. It is possible that this fact more than any other has caused good firms to have to go out of the contracting business.

5. Profit

As to the necessity of profit we can all be agreed. As to the amount which must be added as a percentage on the cost, difference of opinion will exist, but it must be remembered that the contracting business is a particularly hazardous one; that it is irregular in volume and that every contract will not necessarily be profitable.

Furthermore, it must be remembered that the average merchant sells goods from his shelves at a profit, with a definitely established cost for the goods themselves. The manufacturer sells on short-term contracts—his overhead, plant installation and plant maintenance costs are established and regular, and while he may not in all cases be willing to admit it, the manufacturer is practically working on a cost plus basis today, the only difference in most cases between his method of fixing prices and that of a cost plus construction contract being that the manufacturer can and does add a larger profit for the use of his organization, brains and energy. The contractor must provide his plant, must guess at the cost of it, in place, and must guess at the operating cost, must guess successfully if he is to stay in the business as to what the labor market will be; and if he is willing to do this he is surely entitled to a fair margin of profit.

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*From a paper presented at the monthly meeting of the Northwestern Association of General Contractors, Jan. 26, 1920.

†Chairman, Committee on Cost Estimating, Northwestern Association of General Contractors.

The following items also enter into most work and must be considered in detail before the preliminary cost of a piece of work can be considered as complete:

Interest; overhead expense; bonds; insurance—employers' liability, public, fire insurance, special risks; freight on outfit to and from work; moving in and out; land damages; camp and other buldings; preliminary work; cost of materials plus freight; hauling materials; supervision; labor; loss on board; transportation of labor; tools; plant rental; supplies; running repairs; general repairs; special; machinery; fuel and power; water.

Taking up these items in order we will comment briefly on each.

Interest.—This is covered in our discussion of financial credits.

Overhead.—A contractor should establish the proper cost of the overhead charges in his business. This should include the charges, salary allowance for members of the firm, traveling expenses, etc. Provision should also be made here for the maintenance of an equipment storage yard.

Bonds.—No comment should be necessary here on this item.

Insurance.—It is not necessary to make a discussion of the ordinary items, but we wish to call attention to the fact that prudence should require that any combustible material, together with camps, storehouses, etc., should be insured; and such insurance is, of course, a proper item of cost to the work.

There are often special risks which occur upon a job which may be protected by insurance, and such insurance is also part of the cost.

Freight on Outfit.—This is possibly a portion of the item following, but we have listed it separately because we believe that many contractors under-estimate the amount of freight that they will be required to pay on their outfits in such cases.

Moving in and out Expense.—This is an item frequently overlooked by contractors, but one which requires careful consideration. First, there is expense of loading outfit in the contractor's yard; second, the unloading of it at point of destination; third, the moving of it perhaps many miles across country; fourth, the setting up and getting plant ready to operate; and the reverse of all these operations until the plant is again delivered in the contractor's yard.

Land Damages.—This is an item which we believe many contractors neglect entirely and still it is one which costs considerable sums of money. This seems particularly true in connection with county road work.

Land damages accrue from the use of property for camping purposes, from moving outfits across fields for the diversion of public highways, and for storage, yard and other constructive layout.

Camp and Other Buildings.—This is another fruitful source of under-estimating by contractors, often in the loose assumption that "The boarding house will pay for the camps." If such a condition ever existed it must have been a great number of years ago and we believe that present day conditions necessitate including the cost of all camps and temporary buildings required to carry on the work. We further believe that contractors should be careful to avoid the thought of high salvage values to avoid subsequent disappointment.

Preliminary Work.—This is an item which should not only be considered in cost estimating, but we believe that we should digress from the subject for a moment and call attention to the fact that it is probably a duty which every contractor owes to himself to work out a definite scheme of handling a piece of work before he proceeds with an estimate. This does not mean that he must detail the laying out of an entire piece of work, but that he must see clearly that a certain general line of procedure can be followed with expectation of proper results therefrom.

Cost of Materials.—Mention is made of this particularly to emphasize the fact that a cost estimate is usually based on certain material quotations, and it is very necessary in these times that a prospective bidder should be careful to be properly covered with material quotations when making a bid and to close up promptly with the material dealers after the award of the contract.

In connection with this comes a question of freight which must not only not be overlooked, but in case of the present railway situation it would seem necessary for every bidder to make a special provision in his proposal to protect against a change in freight rates during the time of the work.

Hauling Materials.—All hauling costs should be carefully analyzed, as they are often a fruitful source of under-estimation.

Supervision.—Care should be taken to see that any computation of labor also includes any supervision which is not covered in the item of overhead. This would usually mean general foremen, timekeepers, labor agents.

Labor.—Labor is perhaps the most difficult item in the computing of cost which a contractor has to deal with. Rates have been raising for several years and it is apparent that wages have not reached their peak. Provision must be made somewhere to protect against what the bidder considers the maximum rate which will accrue during the life of the contract.

Loss on Board.—In most cases there is a definite board loss in connection with camps. While this may not be true with large camps, working through a considerable period of time, the small movable camp such as is in vogue on highway work usually contributes a constant loss to the work.

Transportation of Labor.—This is an item very often neglected, yet it is very common to have to advance railroad fare to laborers, with the resulting increase in the cost of the work.

Tools.—Contractors often fail to make the proper allowance for tools. Careful analysis of work done will show that a tool item is a very appreciable one in every contract and will also indicate that tools do not carry any too well from job to job, but there is a definite and heavy loss on every job in connection with this item.

Plant Rental.—As mentioned before, this should be covered by special paper.

Supplies.—This is an item which is often neglected as being a minor consideration. On certain classes of work it is really, instead, a very heavy item. The cost of packing, grease, hose, rubber boots and other rubber goods should be given careful consideration, and the contractor will save himself money by checking up his past work and arriving at a clear understanding of what such costs really are.

Running and General Repairs.—These should be discussed in connection with the use of plant rental, but in any case the contractor must understand that they are necessary parts of the cost of doing a piece of work.

(Continued on page 240)

The Design of Drainage Structures and Bridges*

By G. G. WICKLINE†

The proper selection of types and the design of drainage structures and bridges for highways are of prime importance.

Many structures during the past year, on account of poor design and improper location, have rendered important highways impassable. The following discussion will cover some of the main points with reference to the determination of size, the selection of types of structure, and the location and design of various short span highway structures.

Determintaion of Size

For culverts, i. e., spans up to 10 ft., the drainage areas should be determined by actual survey, in the absence of reliable data upon an existing structure known to be of ample size. Frequently the existing structure is too large. In such case the profile cross-section or "ravine section" of the stream and the high water marks will afford the data for determining the proper waterway area. However, in all cases a good margin of safety should be provided.

The statements of inhabitants of long residence in the vicinity and the presence of drift material lodged in the tree tops and shrubbery are valuable data. Often the old inhabitants disagree with reference to high water warks. Proper allowance should be made on the side of safety for such variation.

The Federal Bureau of Public Roads conducted an investigation as to the methods employed by the various railways and state highway departments for determining the proper waterway area for culverts and found that there is a general preference for the use of the formula devised by Prof. A. N. Talbot, which is:

$$A=C\sqrt[4]{M^3}$$

Where "A" equals the area of the culvert opening in square feet, "M" equals watershed area in acres and "C" equals the coefficient depending upon the slopes and general character of the watershed area. Prof. Talbot recommends for mountainous land 1.00, hilly land 0.8 to 0.6, rolling land 0.5 to 0.4, flat land 0.3 to 0.2.

The following are general points to be taken into consideration in the selection of the proper waterway area: 1, Size and shape of watershed area; 2, slopes of watershed area; 3, nature of vegetation and watershed area; 4, nature of soil and watershed area; 5, grade line of stream bed.

By the use of proper judgment, most all of the above points can be taken into consideration in using the Talbot formula. For watershed areas of prairie land of compact soil the higher values of "C" should be used in the formula. For thick, heavy vegetation or loose cultivated soils, the lower values of "C" may be used, but with caution, for a soil subject to erosion is liable to fill up the stream bed with silt, thereby decreasing the waterway area of the culvert.

In many cases there may be doubt as to the proper data to use in the formula or in the selection of the proper waterway area from the existing structure and high water marks in which case the best judgment of the engineer should be used, and the waterway area made too large rather than too small and thus avoid serious damage, future expense and inconvenience. Unless very reliable data from the existing structure is at hand, a survey of the drainage area should be made. It is required by the State Highway Department and the Federal Bureau of Public Roads that the drainage area and the character of the slopes be shown for all project plans involving the use of culverts. The surveys for drainage areas can be very quickly made by the use of the "stadia" method or by the "tangent offset method." The "tangent offset method" can be used to good advantage, which consists in setting a point at convenient sight distance with a transit, and then turn 34½ minutes and set another point. The distance measured between the two points, measured in feet, multiplied by one hundred, will represent the distance between the observer and the point. By the use of a line rod the distances may be measured several thousand feet at each sight. The courses and distances of such surveys may be plotted up to a large scale and the area determined by dividing into triangles or scaling or by the use of planimeter. In farming districts it should be further emphasized that ample head room and size of opening should be provided to provide a margin of safety against the filling up of the stream bed by silt.

Selection of Types of Culverts

The use of the following types are provided in the specifications of the State Highway Department:

For the small culverts; Corrugated galvanized iron, vitrified clay tile, vitrified clay segment blocks and cast iron; each type to have sufficient depth of fill over the top and be provided with substantial concrete headwalls at each end.

For large culverts: Stone, brick, plain concrete and reinforced concrete.

The reinforced concrete box culvert is a very popualr type and is most frequently used. The State Highway Department has a number of standard designs for the various types of culverts to be used under different conditions. Overflow crossings, sometimes called "fords" or "dips," are permitted in some sections of west Texas. From observations during the past year, we have come to the conclusion that their use should be limited to locations on light traffic roads where rain storms are infrequent and where a quick run-off will be obtained and where there is no liability of filling of the stream bed on the down-stream side, leaving the dip covered with mud. The use of dips in the vicinity of Austin, Georgetown and Lockhart has demonstrated in a number of cases that the fancied economy in first cost will result in a very high maintenance cost and a generally unsatisfactory crossing during rainy seasons.

Bridges

The spans of greater length than 10 ft. are considered bridges in the specifications of the State Highway Department. The method of determination of waterway area from drainage area described for culverts will have less application for bridges as the length of the structure increases. In most cases, with bridges, the size and elevation of grade line is determined from an existing structure or structures on the same stream.

It has come under the notice of this department within the past year that structures have been planned on highways without sufficient investigation being made with reference to high water marks, and the result has been that a number of structures have had to be practically doubled in span, thus causing considerable embarrassment to the county officials and the State Highway Department and also delaying the work of construction.

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*From a paper presented at the first meeting of the Texas Roadbuilders' Association, Austin, Tex., Feb. 18-20, 1920.

†Bridge Engineer, Texas State Highway Department.

Selection of Bridge Type

In the selection of the proper type of bridge to use, the following points should be observed:

The safety of the structure against destruction from floods; adequacy to serve the traffic, and ultimate economy.

For safety, the piers should not be located near the center of the channel. The main channel span should be used in cases where practicable. The character and amount of drift should be taken into consideration. For heavy traffic highways, a type of structure built of the more permanent material is more economical in the long run. Comparative estimates should be made of several types of layout for the structure in order to determine the proper and most economical layout.

For the low heights, short spans are used for economy. Where high piers are necessary, long spans are more economical. Careful investigation and study should be made for each bridge structure. The location should be very carefully made as regards grade and alignment. The approach grade should be continued for a considerable distance on to the embankment approach. The embankment approach should be slightly higher than the bridge approach in order to provide for settlement, and make an easy transition from the earth approach to the bridge approach, having in mind the comfort of the traveling public. To avoid trouble from drift, the bridge should be located at approximately right angles to the direction of the current, if possible do so, and the approaches should be kept on a straight line for a considerable distance on each side of the bridge. Good judgment and common sense should be used in reconciling the alignment of the bridge to the direction of the current of the stream in making a bridge location.

Design of Structures

In the design of a bridge structure, general dimensions as length of spans, width of roadway, are determined, and then with the assumed dead and live loads the design is made. For the floor system loading, the State Highway Department specifications prescribe a concentrated live load consisting of a 15-ton typical truck with axles spaced 10 ft. between centers and wheels 6 ft. betwen centers, ⅜ of load on one axle, with 25% impact added for fills less than 2 ft., and for the design of the trusses or girders a tabular uniform live load of 80 lb. per square foot for spans up to 100 ft. with a 2-lb. reduction for each 10 ft. increase in spans up to 180 ft. and beyond the 64 lb. per square foot. The concentrated live loads selected by the State Highway Department of Texas in the revised specifications of 1920 are general averages of the requirements of other states having highway traffic under similar conditions. There are one or two of the poorer, smaller states of the Union that provide for a smaller concentrated live load, but many of them are much heavier. The state highway departments using as a concentrated live load a 15-ton truck, tractor or roller are as follows: Illinois, Iowa, Kentucky, South Carolina, Virginia, West Virginia and Wisconsin; and for medium traffic roads: Connecticut, Ohio and Nebraska. The following states for heavy traffic roads provide for a heavier load than 15 tons: Colorado, Connecticut, Delaware, Massachusetts, Michigan, Minnesota, Montana, Nebraska, Pennslyvania, Utah and Washington.

The assumption of a concentrated live load does not necessarily mean that the structure designed for one specification would be stronger or heavier than that for another, unless the asumptions with reference to the distribution of the concentrated live loads are the same.

There has been some investigation and a number of tests made with reference to the distribution of concentrated live loads on concrete floor slabs, within the past few years. The State Highway Department of Ohio has made a number of tets from which it recommends that the effective width of distribution under a concentrated load shall be .6L+1.7 ft., where the width of the slab is greater than ⅛ the span plus 4 ft., "L" being the length of span in feet. At the Illinois Engineering Experiment Station a number of tests along the same line were made by Mr. W. A. Slater, in which the effective width is equal to 1⅓X+d where the width of the slab is greater than twice the span length and where "X" is equal to the distance to the nearest support and "d" the actual width over which load is applied.

Mr. A. T. Goldbeck of the Federal Bureau of Public Roads has also made a number of tests in which the effective width of distribution is given as .7 L, where L is the length of span and where the width of slab is greater than L.

Mr. M. S. Ketchum, a bridge expert and Dean of the Engineering Department of the College of Colorado, recommends the effective width of distribution as ⅔ L + c, where "L" is the length ofs pan and "c" is the width of tire, which is a general average of all the recommendations.

In the revised specifications of the State Highway Department of Texas a distribution of concentrated live loads recommended by the Bureau of Public Roads has been adopted, which is slightly more conservative than the results obtained from the above formulas and gives a distribution for fills less than 8 in. over a 4-ft. square; between 8 in. and 18 in. over a 5-ft. square; 18 in. and over, over a 6-ft. square.

The distribution of load to stringers for wooden floor bridges is as follows:

When spaced 2 ft. between centers, each interior stringer should be designed to carry ½ of the full specified wheel loads; and when spaced 8 ft. between centers each interior stringer should be designed to carry ¾ of the specified wheel loads which can come over same. Each wheel load shall be considered as applied to the stringer at a point.

For bridges with concrete floors and longitudinal stringers of steel or reinforced concrete, where the spacing of stringers is 4 ft. or less, each interior stringer shall be designed to carry ⅔ of the full specified wheel loads; and when spaced greater than 6 ft., each stringer shall be designed to carry the full wheel loads which can come over it, and proportionately for other spacing. Each wheel load shall be considered as applied to the stringer at a point.

The details of computation of stresses and design of sections of members of a truss are covered in the specifitions and text-books on the subject, to which reference is made.

The design of the substructure of a bridge should receive serious consideration. Before the calculations for the design are made, or even before the layout of the structure is selected, careful investigation should be made of the foundation conditions by making borings or soundings to determine the character of the material on which the bases of the piers and abutments will have to rest. It is necessary to have this foundation before an economical layout for the structure can be selected. Where rock foundation cannot be secured, good clay foundation with spread footings may be used, but where neither can be secured it is necessary to use piling. The test borings or soundings should be of sufficient depth to determine the length of piling that will be required. Great care should be exercised in locating the piers to avoid placing them in the main current or path of drift. A pier in the path of current or drift is a constant source of trouble. By all means the pier base should be carried down a sufficient depth to prevent undermining, for fuly 90% of the failures of bridge structures are due to poor foundations.

An eminent bridge engineer, Mr. Theodore Cooper, states that: "The most perfect system of rules to insure success

(Concluded on page 240)

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

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Copy for classified and other advertisements where proofs are not required will be accepted until noon on Monday of the week of issue.

Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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ADVERTISEMENTS AND TRADE LITERATURE

Highway engineers who would keep abreast of their profession have to be familiar with current practice not only with respect to methods of doing work but also with respect to the available road building machinery.

Most progressive engineers in all branches make good use of technical jurnals to obtain data on ways of doing work and to gain information on the use of materials and equipment. The text pages of such publications supply the former and, to a less extent, perhaps, the latter. But for many reasons—one of the chief of which is the lack of space—it is impracticable to give the highway engineer all of the information he needs concerning materials and machinery, particularly the latter, in that part of a magazine devoted to text matter. A great mass of such data is to be found in the advertising pages and still more is to be found in the trade literature referred to in the advertisements and in the brief notices of new catalogs and the like that are printed in the reading pages of nearly all technical and trade journals.

Catalogs and similar publications form a large part of the working library in many an important engineering organization. Not infrequently a catalog or a handbook of a commercial character is one of the most used and most valuable reference books in a library of that sort. The engineer in any line will find much of the information he has almost daily occasion to use in catalogs, handbooks and miscellaneous publications of the firms manufacturing materials or machinery used in that line of work.

While a great many engineers make the greatest possible use of such sources of information, it is very likely that a great many others fail to do so. The pages of "Good Roads" contain many references to new trade literature, most of it obtainable for the asking. Highway engineers will find these catalogus, circulars and the like well worth the slight effort required to write and get them.

WHY NOT DRAG EARTH ROADS IN CITIES?

There is hardly a city that hasn't a considerable mileage of earth roads within its limits.

In the spring these roads become seas of mud, impeding traffic and spoiling the appearance of the sections they traverse.

Why is it not common practice to drag such roads as soon as the frost is out of the ground and while they are wet? In other words, why not treat them just as country roads are treated in the more progressive communities?

It may be that this procedure is followed in some cities; it is certain that it is not in the majority of eastern municipalities. Probably few city street departments possess road drags, hones or planers, but that could be remedied at a really trifling expense and the cost of doing the work would be nelgigible compared with the good it would do.

COST ESTIMATING FOR CONTRACTORS

The paper on "Cost Estimating" printed on other pages of this issue should be of more than passing interest to road builders—especially to engineers, for it will give them a better idea of some of the difficulties a contractor faces even before he begins construction.

According to the author, the contractor figuring on a job must take into account five main elements: Financial, credit, contructive skill, use of plant, hazard, and profit. He discusses each of these at some length and then passes to the consideration of other factors, many of them subdivisions of the five main elements, all of which, Mr. Helmers says, " must be considered in detail before the preliminary cost of a piece of work can be considered as complete."

Probably the first of the five chief elements mentioned—financial credit—is the one least considered by those who are without contracting experience. Any road contract of any considerable size represents a large investment by the contractor. The plant, equipment and tools he uses, especially in up-to-date work where extensive use is made of machniery, stands for no small sum. The materials used also frequently entail a large outlay, and his payroll, repairs and other constantly recurring items mean a continual putting of money into the job. And under the existing plan of payment, it is often a long time before he can begin to take money out of the job.

Another factor not always appraised at its real value is the contractor's "constructive skill," as the author styles it. He points out that the man engaged in the contracting business is entitled to compensation in the form of a salary and that this item should be taken into consideration in the preparation of the bid. The fairness of this contention can not be denied. The contractor of ability brings to his work not only "constructive" skill but also executive ability, the gifts of the financier and the aptitude of the engineer. These are valuable enough—and rare enough, combined in one man—to command generous remuneration.

The use of plant is a very important item also—in the opinion of Mr. Helmer, sufficiently so to justify separate consideration. In a measure, however, it is included in the discussion of financial credit.

Of hardly less importance than financial credit is the element of hazard. The risks a contractor assumes are perhaps greater than those in almost any kind of business venture, especially in these days of over-night price advances and uncertain labor supply. They are greater than they should be, and greater than they need be.

New York Appropriations

Governor Smith of New York has signed the McGinnies bill, appropriating $3,750,000 for the state's share of constructing federal aid roads, and the Machold bill, appropriating $300,000 as the state's first share of building the federal aid roads. These laws and a previous one appropriating $7,000,000 for highway construction make a total of $11,050,000 available for highway work.

Highway Work in Iowa in 1919 and 1920

Classification of Road Mileage—Work in 1919 Greater in Volume than That of Any Previous Year—Costs were also Greater—1920 Program May Be Curtailed Because of Prices and Lack of Bidders

During the year 1919, Iowa spent a total of $16,154,078 for road and bridge construction. County and township roads cost $9,299,356, and bridges and culverts cost $6,854,722. The total sum spent in 1919 for highway construction was the highest in the history of the state.

The road system of Iowa has a total mileage of 104,082 mi., with 6,421.02 mi. in the primary system, 10,442.72 mi. of county roads and 87,218.26 mi. of township roads. Costs of road work were higher last year than ever before as seen by reference to Table I.

The percentage of engineering cost of highway work in Iowa remained practically the same from 1914 through 1919, as shown in Table II.

Although the 1920 program calls for the construction of 300 mi. of hard-surfaced roads, contracts are being let very slowly because of high prices and a paucity of bidding contractors. Contracts for paving 106.23 mi. with brick and concrete have been already let and it is hoped that at least half of the scheduled program will be contracted for during the season. Of the contracts already awarded, 84.53 mi. call for concrete pavement at prices ranging from $3.59 to $4.37 per square yard, and 21.7 mi. of brick pavement at prices from $5.43 to $5.93 per square.

TABLE I—SHOWING INCREASING COST PER MILE OF ROAD WORK IN IOWA

	1917	1918	1919
Permanent grading	$ 1,047.97	$ 1,633.10	$ 2,532.77
Temporary grading	1,732.69	1,770.54	2,198.29
Natural grading	154.42	153.64	212.48
Gravel surfacing	1,107.97	1,093.38	1,758.50
Paving	28,221.91	31,822.73	41,756.58
Dragging	24.04	31.02	41.80

TABLE II—PERCENTAGES OF TOTAL COSTS OF IOWA ROAD WORK CHARGEABLE TO ENGINEERING

	1914	1915	1916	1917	1918	1919
County engineering	2.85	2.75	2.53	2.58	3.19	2.78
Highway commission	.64	.60	.63	.59	.78	.75
Total per cent engineering cost	3.49	3.35	3.16	3.17	3.97	3.53

Many foreign contractors have bid upon projects and latest reports show that they have taken 41.02 mi. and that Iowa contractors have taken 65.21 mi.

Canadian Bridge to Cost over $1,000,000

Plans Completed for Bridge at Hamilton Terminus of Toronto-Hamilton Highway

Plans and estimates for a highway bridge at the western entrance to the city of Hamilton, Canada, completing the Toronto-Hamilton Highway, have been finished by E. R. Gray, City Engineer of Hamilton. The estimated cost of a high level concrete structure is placed at $1,419,100 and the estimated cost of a steel structure is $1,226,590, both exclusive of land to be acquired.

In designing the concrete structure, Mr. Gray determines its length at 1,300 ft. A center span of 416 ft. and other spans of 156 ft. each are provided for, the roadway standing 87 ft. above the water of the harbor. The roadway is 40 ft. wide, flanked by 6 ft. concrete walks.

Dixie Highway Nears Completion

Decision of Georgia Supreme Court that Ware County Bonds are Legal Stimulates Construction—Other States Also Active

Following the recent decision of the Georgia Supreme Court declaring the bond issue of Ware County legal, work has commenced on the last section of the Jacksonville-Waycross link of the Dixie Highway. The states of Florida and Georgia and the various counties therein, are trying to have this part of the highway in good condition by 1921.

Work on the mountain sections between Nashville and Chattanooga and between Cincinnati and Knoxville is progressing. Georgia has commenced the grading in Charlton County, starting at St. Mary's river with 50 convicts, 23 teams and considerable equipment. The road in Florida will graded and surfaced from Jacksonville to the Georgia line at St. Mary's River.

———OOO———

Taylor County, West Virginia, recently voted a $1,000,000 bond issue for the construction of 40 mi. of highway.

Wet Concrete will be Hauled Four Miles in constructing a section of the Dixie Highway extending north and south from Grant Park, Illinois, during the coming season.

The Nebraska Department of Public Works has 45 motor trucks in use for patrol maintenance on federal aid roads. Approximately one mile a day is being maintained by the crew of each truck.

The War Department will send a convoy of motor trucks over the Bankhead National Highway, which extends from Washington, D. C., to San Diego, Cal. Leaving Washington some time in June, the convoy will proceed under army regulations to Los Angeles.

Good Roads Week in New York State will be observed during the week of May 17, according to a recent announcement by Secretary of State Hugo. It is planned by this means to arouse the interest and sentiment of the public for better highways. Emphasis will be laid upon the fact that good roads reduce the cost and time spent by the farmer in marketing his goods and so tend to lower the cost of living.

Statement Showing the Status of Federal Aid Funds

The accompanying table, recently issued by the Bureau of Public Roads, U. S. Department of Agriulture, shows the status of federal aid funds on March 31, 1920. It was compiled from data on projects approved, as reported by the district engineers of the bureau.

State	Balances available from apportionments for the fiscal years of:			Total apportionment still available.
	1917-8-9	1920	1921*	
Alabama	$ 72,604.11	$1,995,501.80	$2,104,883.51	$4,172,989.42
Arizona	——	810,213.98	1,373,644.16	2,183,858.14
Arkansas	——	1,156,091.78	1,685,178.09	2,841,269.87
California	——	322,593.64	3,054,675.51	3,377,269.15
Colorado	——	1,596,537.28	1,755,759.17	3,352,296.45
Connecticut	——	137,547.22	613,349.43	750,986.65
Delaware	——	17,290.62	162,674.81	179,965.43
Florida	——	602,816.41	1,147,447.92	1,750,264.33
Georgia	——	——	2,564,693.45	2,564,693.45
Idaho	——	——	1,027,253.64	1,027,253.64
Illinois	——	——	2,505,801.86	2,505,801.86
Indiana	——	——	16,602.40	16,602.40
Iowa	——	——	279,240.11	279,240.11
Kansas	——	——	1,957,843.36	1,957,843,36
Kentucky	253,954.53	1,856,043.83	1,951,755.43	4,061,753.79
Louisiana	——	47,966.58	1,362,231.13	1,410,197.71
Maine	——	——	750,671.21	750,671.21
Maryland	——	——	465,990.18	465,990.18
Massachusetts	——	925,017.95	1,472,788.83	2,397,806.78
Michigan	——	930,752.58	2,891,667.97	3,822,420.55
Minnesota	——	——	1,708,409.62	1,708,409.62
Mississippi	——	1,307,227.29	1,807,557.17	3,114,784.46
Missouri	——	796,972.05	3,387,899.60	4,184,871.65
Montana	——	1,558,098.79	2,006,990.13	3,565,088.92
Nebraska	——	——	1,085,814.61	1,085,814.61
Nevada	——	1,152,498.10	1,276,344.43	2,428,842.53
New Hampshire	——	19,054.70	414,838.93	433,893.63
New Jersey	——	——	272,119,17	272,119.17
New Mexico	——	721,462.67	1,598,467.85	2,319,930.52
New York	——	4,485,582.52	4,971,893.11	9,457,475.63
North Carolina	——	——	289,124.78	289,124.78
North Dakota	——	609,355.70	1,536,227.80	2,145,583.50
Ohio	——	731,797.54	3,706,246.81	4,438,044.35
Oklahoma	——	1,058,599.50	2,302,478.33	3,361,077.83
Oregon	——	67,027.10	1,576,152.03	1,643,179.13
Pennsylvania	——	——	4,467,785.17	4,467,785.17
Rhode Island	——	133,074.47	233,256.87	366,331.34
South Carolina	——	844,009.66	1,436,019.04	2,280,028.70
South Dakota	——	362,200.99	1,615,779.44	1,977,980.43
Tennessee	——	2,069,075.33	2,261,913.90	4,330,989.23
Texas	——	4,844,640.19	5,861,598.46	10,706,23865
Utah	——	——	320,530.94	320,530.94
Vermont	——	359,304.11	450,077.09	809,381.20
Virginia	——	1,146,248.18	1,977,673.83	3,123,922.01
Washington	——	——	909,812.72	909,812.72
West Virginia	——	——	856,999.53	856,999.53
Wisconsin	——	2,342,489.24	2,544,945.35	4,886,434.59
Wyoming	——	674,153.97	1,233,715.84	1,907,869.81

*Funds shown in this column cannot be used prior to June 30, 1920.

The Texas Highway Program

A Brief Summary of Expenditures Made and of Progress on Federal and State Projects

In a recent statement, Chairman R. M. Hubbard of the Texas State Highway Department described the Texas road program as follows:

"The State of Texas has already been allotted out of the two appropriations made by Congress for aiding in the construction of roads, a total of $16,091,000.

"For various reasons the getting under way of the large road building program, finances for which have been provided, has been delayed materially.

"The records of the State Highway Department show that to date applications have been completed by various counties for federal aid amounting to $7,022,652.82, and for state aid amounting to $1,790,905.30. The total estimated cost of the federal and state projects, to which the above amount of aid has been allotted, is: Federal, $20,508,533.13 and state, $7,042,899.20, making a total estimated cost of work for which applications have been completed for either state or federal aid, of $27,551,452.33. Of this vast amount of work, contracts have actually been awarded to date for work amounting to $3,754,649.98.

"Over 400 mi. of road that have been contracted to date have been entirely completed and a great many more miles are in various stages of completion. With the opening of spring the amount of contracts that are advertised each month is increasing and we expect by the end of this year to have a vastly increased amount of work under construction. In fact, Texas is entering upon an era of road building that will far exceed any period in our history.

"All of the state and federal funds that are available in this state have been alloted to the various counties of the state and the rapidity with which this work is getting under way depends largely upon the diligence of the county officials in perfecting their applications and plans."

Massachusetts Highway Plans

About $7,000,000 to be Spent—Several Important Projects Included in Program

Funds totaling approximately $7,000,000 will be available for highway work in Masachusetts during the present year. The largest project to be undertaken in that state will be the construction of the road from Orleans to Provincetown, a distance of 25 mi. The surface will consist of a sand and asphalt mixture and the road will be widened to 18 ft. The estimated cost of this work is about $400,000. The Mohawk Trail west from Greenfield will be paved with concrete at a cost of $350,000. Considerable excavating and the relocation of the road for the reduction of a 14% grade to a 6% grade are entailed in this project. The Northampton and Pittsfield Road will be surfaced with bituminous macadam and will cost approximately $300,000. Six miles of road between Newburyport and Boston will be surfaced with bituminous macadam at an estimated cost of $275,000.

Pittsburgh Fails to Sell Bonds

Offers $7,281,000 of Bonds Bearing Interest at 4½% But Rceeives No Bids—The Low Interest Rate of Bonds Thought Insufficient

Because of the low rate of interest, $7,281.000 of bonds of the City of Pittsburgh, Pa. did not receive a bid on April 8.

The bonds bear 4½% interest and the failure to receive bids is ascribed to the present condition of the bond market which demands a greater interest rate. These bonds constitute a part of the recent $22,000,000 bond issue authorized for public improvements and the city is ready to advertise for bids on the projects but contracts cannot be awarded until the bonds are sold.

Among the projects for which the bonds were issued are: Widening of Second Ave, $1,410,000; Boulevard of the Allies, $1,140,000; Island Avenue Bridge, $90,000; widening Broad Street, $777,000; Baker Street, $90,000; widening of Ferry Street, $351,000; Mt. Washington Roadway, $30,000; East Street, $300,000; Warrington Avenue, $132,000; bridge at Sheely Park, $270,000.

———OOO———

Flood waters in White River have caused considerable damage to the bridge west of Martinsville, Ind., and the bridge is considered unsafe for heavy traffic.

A New Road District in Polk County, Arkansas, has been formed and will be designated as No. 4. E. Myers, L. H. Johnson and M. Dover, all of Hatfield, are commissioners of the district, which includes two proposed highways running from the Jefferson Highway at Hatfield to the Oklahoma line.

HIGHWAY TRANSPORTATION

"Ship by Truck—Good Roads Week"

"Ship-by-Truck—Good Roads Week" will be observed throughout the United States during the week beginning May 17.

Motor trucks, trailers and farm tractors will start out from 100 of the large cities and travel through the surrounding country to distances of 50 to 100 mi. in order to stimulate the interest of the public in highway transportation and better roads. Several governors have issued proclamations for the observation of the week and others have signified their intention of issuing such proclamations.

Hard Roads Banned by Horsemen

Horse Association of America Condemns Work of Road Builders in Past Ten Years and Calls for Roads Suitable for Horses

In a recent pamphlet issued by the Horse Association of America, containing a statement of the aims and objects of the association, the following statement appears:

"The construction of highways adaptable to horse-drawn vehicles is one of the nation's greatest needs. The roads constructed within the recent past are a menace to the horse and a reproach to the nation toward whose development the horse has been a most valuable contributor. By confining their efforts to the building of hard, smooth pleasure roads, the state legislatures are barring the horse from the nation's highways.

"In order that the horse be given recognition on the public highways, it is necessary that the laws providing for the construction of roads take horse-drawn vehicles into consideration and make provision therefor. Whether the law shall provide for horse roadways on either side of the automobile roadway, or whether other plans be adopted, the subject demands immediate and intelligent action.'

Selecting the Proper Truck

Some of the things to be considered in the selection of a motor truck for particular kinds of service have been pointed out in a statement by a representative of the Pierce-Arrow Motor Car Co.

"Roads, loads and volume are three things that enter into the selection of a motor truck," according to the statement to which reference is made above.

"If capacity loads can be carried regularly, it is a fact that the larger the truck the more economical it is to operate. Savings effected through observance of this rule greatly outstrip any savings that might be effected in the purchase of a smaller-sized unit.

"For instance, coal companies have proved to their own satisfaction that 5-ton trucks deliver coal at nearly one-half the per-ton cost of delivery by 1 or 2-ton trucks. The reason for this is plain. The overhead expense of the 5-ton truck is but slightly more than that of a 1 or 2-ton truck, yet the volume of coal delivered is from four to five times as great.

"Size determined, the question of chassis length must be considered. Lengthy material, such as pipe, or lumber, requires a long wheel-base truck. Bulky but light material, such as empty barrels or furniture, likewise should be handled with a long wheel-base truck. Some types of load can best be hauled with trailers or semi-trailers. The question of body type is a separate one.

"The selection of the proper gear ratio is most important. Good, hard roads with only normal grades require gearing which does not sacrifice speed for unnecessary power. Conditions which present short stretches of heavy going or an infrequent steep grade should have gearing which provides a maximum high-gear speed with lower and reverse gears giving abnormal pulling power. Road conditions which do not warrant a high speed, or a hilly country having good roads, require a gear ratio giving a lower high-gear speed than normal. Special gearing should be specified where extreme conditions are encountered."

Rapid Growth of Motor Transport

The rapid growth of motor transportation is indicated by a recent report to the effect that there are more than 400 motor express lines in New York State and not less than 5,000 motor express lines in the United States.

With a capital of $1,000,000, the Patriot Motor Express Co., of Wichita and Kansas City for example, is reported to be operating in Kansas, Nebraska and Missouri and will have 250 motor trucks in use. With 150 trucks traveling over 12 routes having a total mileage of 1,000 mi. the New England Transportation Co. operates with Boston as a center. The map of the route of the American Motor Freight Co., Sioux Falls, S. D., includes 80 towns in Minnesota, Iowa and South Dakota.

Cooperative organizations for the marketing of agricultural products by motor truck are rapidly springing into existence. The Farmers' Cooperative Co., of Harford County, Maryland, is said to be the first cooperative transport company in this coutnry and is being used as a pattern in the formation of other combinations. A description of the organization and operation of this association was printed in "Good Roads" for April 12, 1919.

California leads all other states in the number of automobiles in proportion to population, according to a recent statement. There are 493,463 machines owned in the state, which gives it one to each 5.6 persons. On this same basis, Iowa formerly ranked first, with Nebraska second. The gain in registration in 1919 brought California from seventh to first place, leaving Iowa second.

The "Ship by Truck" movement should have the backing of everybody, according to Sidney Bowman, the New York distributor of Kissel cars. "The present railroad freight crisis," he said in a recent statement, "emphasizes this necessity and shows clearly that the nation's transportation requirements make good roads a national necessity. We should not leave this movement up to any one class of business men. It is a movement that demands cooperation of not only motor truck makers, distributors and dealers, but of motor truck owners and drivers. We should all realize that motor truck transportation has been proven an efficient, dependable and economical form of haulage and delivery. By every community, every county, every state cooperating in the matter of building more good roads and improved highways, there will be formed an endless chain of economical transportation—an invaluable addition to the resources of the country."

EQUIPMENT—TRADE—MATERIALS

Gravel Aggregate Used in Building Warrenite-Bitulithic

The Warren Brothers Company, of Boston, Mass., has recently issued a booklet in which are compiled statistics of the yardage of Warrenite-Bitulithic in which gravel is the mineral aggregate.

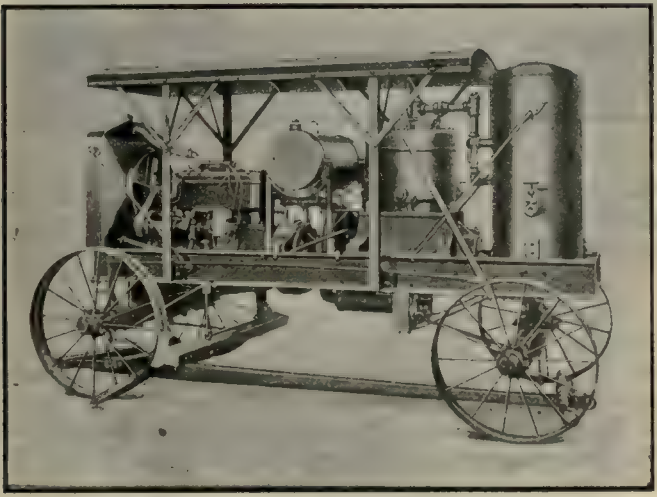
Relative to the use of gravel, the report quotes a prominent state highway engineer to the effect that it is possible to make a gravel mixture with from 1 to 3% less voids than there are in hard, brittle crushed stone; that gravel has stood the test of wear of ages; that it offers maximum resistance to wear from the shoes of horses or automobile chains, because it is thicker in proportion to its length, and also that the theory that gravel would pick out of the surface has been disproven by experience.

A total of 3,697,474 sq. yd. of Warrenite-Bitulithic pavement, using gravel in the mineral aggregate, has been laid largely in states in the Northwest. This surfacing was laid on various bases, the most important of which are dense mixed bituminous concrete, cement concrete and old macadam.

New Portable Air Compressor

The Sullivan Machinery Co., of Chicago, Ill., has announced in bulletin 75T, a portable air compressor of new design. The compressor, shown in the accompanying illustration, is used in general rock drilling work, breaking up pavements, riveting in the construction of bridges, and similar operations.

The outfit, known as the Class WK-31 compressor, includes a new specially designed 2-cylinder, vertical air compressor, driven by a Buda 4-cylinder, 4-cycle, heavy duty tractor gasoline engine, through gear and pinion. The truck body is made of heavy channel irons and is mounted on heavy steel wheels, or when desired, the entire rig can be set on a flatcar. The outfit is protected from the weather by a steel canopy top with canvas side curtains.


NEW SULLIVAN PORTABLE COMPRESSOR

The air compressor has a displacement of 150 cu. ft. of free air per minute and requires 32 hp. for operation against 100 lb. pressure. The air is admitted and discharged from the cylinder by means of improved wafer valves. These are placed radially to the cylinder axis, close to its upper end, and are held in place by flat circular leaf springs. The valves open against specially designed guard plates, intended to give a wide port opening with small clearance loss. The compressor is cooled by an open hopper jacket into which water may be introduced with a bucket or hose.

An unloading and pilot valve connected with the air receiver, raises the inlet valves from their seats when the demand for air temporarily ceases, permitting a saving of power. Lubrication is effected by a force feed oil pump enclosed in the crank case and oil is delivered under pressure to all bearings. Baffles and wiper rings on the piston prevent an excess of oil from working past the piston and carbonizing the valve and seats.

The cylinders of the engine are cast en bloc, with removable head. The crank shaft is supported on three babbitt bearings and a disc clutch is placed between the engine and the compressor, being thrown out until the engine is up to speed. The accessories of the engine are of the best automobile type and combine simplicity with service. The gasoline tank holds 23 gal. of fuel, which is sufficient for a day's run.

Asphalt Association Holds Annual Meeting

The Asphalt Association held its annual meeting on April 14, at the Engineer's Club, New York City. Several speakers addressed the members, and officers were elected for the ensuing year as follows: J. R. Draney, United States Asphalt Refining Co., N. Y., President; J. M. Woodruff, Sinclair Refining Co., Chicago, Ill., Vice President; Herbert Spencer, Standard Oil Company, New Jersey, Treasurer. The board of directors was reelected with W. T. Headley, of the Headley Good Roads Co., Philadelphia, Carl Hetherington, Hetherington & Berner, Indianapolis, and James Clark, Standard Oil Company of Kentucky, as new directors representing the contributing membership, and James Pearson, Construction & Paving Co. of Ontario, Ltd., Toronto, and J. K. Hollingshead, Standard Bitulithic Co., New York, N. Y., representing the associate members.

The executive committee as chosen consists of J. R. Draney, Herbert Spencer, and J. A. Feely, of the Atlantic Refining Co., Philadelphia.

George O. Smith, Director of the U. S. Geographical Survey, in his address before the association emphasized the necessity of considering the production of petroleum and its products from the standpoint of quality rather than of cost. While there has been a constantly increasing production of petroleum from year to year, according to Mr. Smith, the demand continually outruns the increase in supply and so necessitates most intelligent and vigorous production, coupled with the most useful disposition of the material. It was also pointed out by Mr. Smith that the best available estimates place the undeveloped petroleum resources in the United States at 7,000,000,000 bbl., and that, while the United States has consistently far exceeded other countries in the production of petroleum, it is claimed that the British Empire has obtained control of from 50 to 75% of the petroleum producing areas of the world, thus placing it potentially far ahead of the United States in undeveloped stores of petroleum.

Lieut. Col. Cheney, U. S. A. explained the industrial and vocational training now being carried on by the Army, stating that courses in highway construction and topography are included in the studies.

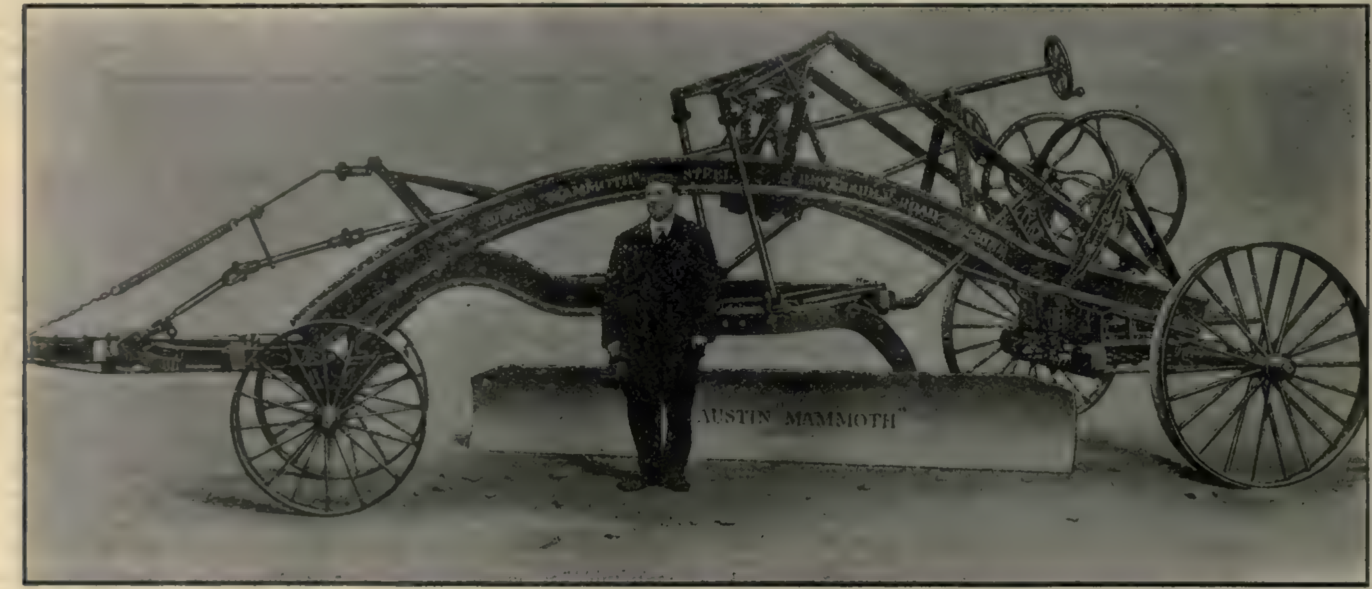
It was announced at the meeting that lectures were given by engineers of the association at 30 technical schools and also that the brochures published by the association will be translated into foreign languages, especially the Japanese, it being stated that Japan is entering upon an era of extensive highway development.

A series of construction specifications covering every type of asphaltic highway is under preparation and will be ready for distribution in a short time. The subject is divided into foundations and surfaces and will be so arranged that specifications will be available for any surfacing on various foundations.

The establishment of a branch on the Pacific Coast was also given consideration.

Nebraska Buys 70 "Mammoth" Graders

Early this year Nebraska purchased 70 "Mammoth" graders for distribution to the various counties of the state to be used in maintaining roads on the state highway system not included in federal aid road projects. The Nebraska Department of Public Works has received from the Federal Government 35 "Caterpillar" tractors, which are being distributed throughout the state. These will each pull two of the graders, forming the equipment of a heavy gang maintenance crew.



AUSTIN "MAMMOTH" GRADER OF TYPE PURCHASED FOR NEBRASKA MAINTENANCE.

The "Mammoth" grader is manufactured by the Austin-Western Road Machinery Co., of Chicago, Ill., each grader weighing 6,350 lb. and having a 12-ft. blade.

The A. & C. Stone & Lime Co., Indianapolis, Ind., has announced the change of the firm name to Mid-West Crushed Stone Quarries Co.

A booklet bearing the title, "The Lakewood Road Plant," and describing the use of Lakewood equipment in highway construction has been recently issued by the Lakewood Engineering Co., of Cleveland, O. The complete plant consists of seven independent units, as follows: Unloading and storing, rail haulage equipment, batch transfer and mixer, finisher, water supply systems and the subgrader. The tunnel system of stock piles for loading concrete materials into narrow-gauge railway cars and the Lakewood road finisher are given special attention in the booklet.

The Strauss Bascule Bridge Co., of Chicago, Ill., has been appointed to design the bascule span of a joint railroad and highway bridge over Inner Harbor at Johnson St., Victoria, B. C. The cost of the bridge will be borne jointly by the city of Victoria, the Provincial Government of British Columbia and the Canadian Pacific Railroad.

"Modern Methods of Concrete Highway Construction," is the title of an 8-page folder recently published by the Barber-Greene Co., of Aurora, Ill. According to this publication the general methods in use on concrete road construction may be classified under four plant layouts. In the first method the materials are stored in piles on the subgrade and hand labor is largely utilized. The second method has central storage piles at a railroad siding with industrial railway running to the road under construction. In the third method the stock piles are made along the road at suitable distances and the mixer operates upon the subgrade. The fourth method is similar to the third except that the mixer is stationed at the stock pile and the wet concrete is hauled to the road.

A leather bound souvenir booklet, entitled "Abstract of Bids," is being distributed among paving contractors by the T. L. Smith Co., of Chicago, Ill. The booklet is pocket size, 4⅝x8., and holds a pad ruled especially for records of bids on various jobs. The record pads are detachable and the company supplies additional pads when the sheets have been used.

———COO———

A Bill to License Engineers in New York State was passed by the Senate on April 15. It has been endorsed by the New York sections of the American Society of Civil Engineers and the American Association of Engineers.

Pennsylvania will have 40,000 Men Working on her Highways during this season, according to a recent estimate. On Jan. 1, Pennsylvania had 527 mi. of uncompleted highways under contract and has let over 130 mi. since that time.

MEETINGS

Calendar of Coming Meetings

May 10-11—American Association of Engineers.—Annual meeting, St. Louis, Mo. Secretary, A. H. Krom, 63 E. Adams St., Chicago, Ill.

May 13-15—League of Texas Municipalities.—Eighth annual convention, Dallas, Texas. Secretary, Frank M. Stewart, University of Texas, Austin, Texas.

June 1-3.—Canadian Good Roads Association.—Seventh Annual Convention, Winnipeg, Manitoba, Canada. Secretary-treasurer, Geo. A. McNamee, 909 New Birks Bldg., Mon-

PUBLICATIONS

COMMONWEALTH OF PENNSYLVANIA. Laws Relating to Second-class Townships. Bulletin No. 12, State Highway Department. Paper, 6x9 in. 98 pages and covers.

Included in this bulletin are the laws of the state relating to second-class townships, which laws embrace the duties of supervisors in the construction and maintenance of highways. The subject-matter is indexed, with the section of the law and the page of the book indicated. Several pages are devoted to answering common questions on the law which supervisors might ask in the performance of their duties.

THE SCIENCE OF HIGHWAY TRAFFIC REGULATION, by William Phelps Eno. Paper, 6x8 in., 100 pages and covers. Illustrated.

This book considers the various phases of highway traffic regulation and contains a proposed standard traffic act. Emphasis is laid upon the fact that for any successful mode of traffic regulation, the public must be educated in the regulatons which they are expected to follow. The laying out and repair of streets and the regulation of one-way traffic, parking and similar special traffic problems are discussed.

"THE COLUMBIA RIVER HIGHWAY, the World's Most Scenic Thoroughfare." Paper 7x5 in., 24 pages and covers, illustrated. Portland Press Club, Portland, Ore.

This little booklet tells by means of picture and story about the Columbia River Highway in Oregon, giving special attention to the fact that many miles of macadam surfacing on this highway have been used as a foundation for bituminous pavement. The copious pictures vividly portray the natural beauty of the country. The Warren Brothers Company has prepared a supplemental phamphlet of the same size containing 16 pages. Fifteen full-page illustrations show sections of the road paved with Warrenite-Bitulithic surfacing and operations in construction work on the highway.

THE NEBRASKA CONSERVATION AND SOIL SURVEY. Road Materials of Nebraska. By G. E. Condra, Director. In two parts, bulletins 5 and 6. Each, paper, 10x7 in., with illustrations and maps.

Part One (bulletin 5) goes into detail on stone road building materials existing in that state. The general geologic structure of Nebraska is first considered, followed by reports on the 34 stone producing members and formations of importance in that state. Copious illustrations, maps and charts are included. Part Two deals with the sand deposits of Nebraska and besides giving information about the sand resources also discusses methods of production as practiced in that state. The use of sand in road making is also considered. Many illustrations are distributed throughout the text showing various phases of the sand industry.

PERSONAL MENTION

John B. Lord has resigned as city engineer of Williamsport, Pa.

H. R. LeSeur has resigned as city engineer of Fort Madison, Iowa.

F. E. O'Brien has been appointed city engineer of Watertown, N. Y.

C. J. Victoreen has been appointed city engineer of Cadiz, Ohio.

R. J. Lewis was recently appointed city engineer of Fort Madison, Iowa.

H. K. Rumberger has been appointed city engineer of Ferndale, Wash.

Paul B. Sutton was recently appointed city engineer of Watertown, N. Y.

John A. Giles has been appointed consulting engineer of Johnson City, N. Y.

Stacy Rumpeltin has been appointed village engineer of Johnson City, N. Y.

A. B. Cook, has resigned as city engineer of Santa Barbara, Cal., to enter private practice.

B. E. Clark has been appointed district engineer with the Oklahoma Department of Highways.

J. H. Stevens, formerly with the New York State Highway Department, is now village engineer of Massena, N. Y.

C. A. Wood, of Stillwater, Okla., was recently appointed district engineer of the Oklahoma Department of Highways.

L. K. Forde has been appointed a district engineer of the Oklahoma Department of Highways.

L. I. Goldberg has resigned his position with the Michigan State Highway Commission to engage in business in Traverse City.

C. W. Cheatham has been appointed senior highway engineer in Alaska of the U. S. Bureau of Public Roads. Mr. Cheatham was formerly stationed at Missoula, Mont.

Willis Whited, Bridge Engineer of the Pennsylvania State Highway Department, has been appointed consulting engineer of the department.

Percy Pennybacker has resigned his position with the Texas State Highway Department to enter the employ of Harrington, Howard & Ash, of Kansas City Mo.

George D. Morrison, formerly Deputy Street Superintendent of Santa Barbara, Cal., has been appointed city engineer of that city.

A. L. Smith, formerly Assistant Engineer of the Alabama State Highway Department, was recntly appointed division engineer.

H. C. Culverhouse, formerly Assistant Highway Engineer of Jefferson County, Alabama, has been appointed assistant engineer of the Alabama State Highway Department.

Major E. A. Kingsley, formerly City Engineer of Little Rock, Ark., was recently decorated by the French Government with the "Merite Agricole," in recognition of his work as officer in charge of road work in the Nevers section in France.

Cost Estimating

(Concluded from page 230)

Special Machinery.—On many contracts it is necessary to employ, in addition to ordinary contractor's plant, some special form of machinery, either purchased from a manufacturer or perhaps built by the contractor for the work. In either case, plant rental is not a proper charge for this class of equipment. The entire cost of it, less its scrap value, must be charged to the one job on which it is used, otherwise a contractor may complete a large amount of work and find the entire profits tied up in machinery which has little value other than scrap.

Fuel and Power.—The cost of power especially varies so much in different localities that the bidder should acquaint himself carefully with the local conditions. If a large amount of fuel is involved careful allowance must be made for the hauling and amount of handling of same.

Water.—This item often becomes a serious obstacle to the proper handling of work and is one that requires a great deal of attention. It sometimes adds very materially to the cost. In addition to this, we wish to impress all contractors with the desirability of investigating the available water supply in connection with a given piece of work before making their figures.

We cannot close the discussion of "Cost Estimating" without dwelling for a moment on the question of cost keeping. The fact that so many contracting concerns are closed out of business each year is a strong indication that something is not correct with the way construction work is figured. A good deal of it comes from neglecting a number of items which we have mentioned above, and which do not appeal to some men as being of enough moment to give direct consideration to when making figures. Other trouble comes from not keeping careful cost data of work done, and analyzing such costs.

It is not the purpose of this paper to go into detail regarding such things, but we believe that a contractor should avoid using manufacturers' statements of operating costs, as well as any other stop-watch methods, as they usually spell loss if not disaster. A certain amount of work done per day with a crew operating at a certain expense per day never means that the division of that daily cost by the daily output is the unit cost of the item in question. There are delays and other things which so affect this price that it may be over 100% out from the actual cost when all things are taken into consideration.

The Design of Drainage Structures and Bridges

(Concluded from page 232)

must be interpreted upon the broad grounds of professional intelligence and common sense."

The tractor and the motor truck are with us to stay, and their use is steadily increasing. Farming is becoming a science and a profession. Heavier machinery is being used as time goes on. In general, the bridges built 20 years ago are inadequate for the present day traffic, so that in designing bridges we should look well into the future.

Reinforced concrete bridges or culverts of good design, materials and workmanship should last indefinitely if proper maintenance is provided. A good type of teel bridge with proper maintenance shuold last for 50 years. If other than substantial types of bridges of these materials are built, they prove a menace to human life and property and in the replacing of same there is an inconvenience to traffic and for this reason, particularly, we consider it good economy to build substantial bridges on main highways.

Most of the bridges built in Texas up to the present time, other than those built under the supervision of the Highway Department, have been designed and built by bridge companies. In a few cases engineers have been employed for the larger structures and the results have been very satisfactory, and structures have been provided that are ample for the present traffic conditions.

The bridge companies dealing with the short span structures have been going on the basis of selling a bridge to cover a certain distance or to span a certain channel, regardless of the engineering principles involved and of the loads to be carried. However, most of the bridges will carry the ordinary farm traffic, but are not of sufficient strength to carry safely heavy trucks, tractors and rollers.

There has been competition among bridge companies in selling a structure to fit the location, rather than to provide a structure of adequate strength, and the results have been that most of the bridges built are of a very light type. Frequently the foundations are washed out and the bridge gives way under a heavy load, resulting in loss of life or injury and a serious delay and inconvience to traffic.

———OOO———

The Lincoln Highway has been selected as the route for the Glidden Tour Reliability Contest from coast to coast.

The Expenditure of $5,000,000 in the Island of Oahu for the construction of military roads has been recommended to the War Department by Maj. Gen. C. G. Morton, U. S. A., in command of the Hawaiian Department.

In the State of Connecticut motor trucks will not be allowed to carry loads of more than 5 tons on gravel and macadam roads A ruling to that effect was recently made by State Highway Commissioner Bennett.

The Bureau of Public Roads will be authorized to spend $496,620 in road investigations under the provisions of the agricultural appropriation bill which recently passed the House. Among the items embraced in the bill are: salaries, $117,900; investigations into systems of road management, $36,200; investigations on methods of road building, $102,300; investigations on chemical and physical nature of road materials, $77,020.

New York State has recently passed a law regulating the use of motor trucks and trailers on public highways outside of cities. The law prohibits the operation of trucks or trailers having a width of more than 8 ft., inclusive of load, a height of more than 12 ft. 6 in., or a combined weight of truck and load of more than 25,000 lb., the load being distributed so that there shall be not more than 800 lb., per inch in width of tire on any wheel.

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

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In old days, driving his heavy loads
From farm to town, over hills and prairies?"

A Vision of BETTER ROADS

WHAT did the teamster see
In old days, driving his heavy loads
From farm to town, over hills and prairies,
Through mud and flood and storm and washout,
By wood-roads and highroads and the great
National Highways from State to State,
His strong horses straining and sweating through
dust or mire—
What did that hardy teamster see
On those long, hard roads behind his laboring team?

Across the years he saw a vision,
Prophetic, happy, haunting and inspired—
A Vision of Better Roads in the days that were to be.
He saw broad, smooth highroads running everywhere
in a vast network over the country,
Roads without dust or mud or weariness or the
constant labor of repair,
Roads pleasant and swift to travel,
Roads clean and safe and paved,
Leading to great cities and friends and business and
on adventurous, delightful journeys,
All over this broad, beautiful land.
He saw himself and his wife going and
returning over these fair highways,
Making trips to town for shopping or pleasure;
He saw his boys and girls going to better schools,
and better satisfied with their home;
He saw an end to dreariness and monotony
and isolation;
He saw his produce carried quickly to market, and
anything he needed brought as quickly
back to his own door;
He saw happiness, comfort and prosperity in that
Vision of Better Roads—
The vision of things which his energy and
resourcefulness and courage are today
bringing to pass.

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GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

WITH WHICH IS INCORPORATED

THE HIGHWAY CONTRACTOR AND ROAD BUILDER

Old Series. Vol. LVIII
New Series, Vol. XVIV

JAMESTOWN, N. Y., MAY 12, 1920

Number
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The Road Work of the A. E. F.

Sketch of the Development of the Road Construction and Maintenance Forces of the American Armies—Kind and Extent of Work—Equipment

The World War has indelibly stamped upon the records of military engineering the vital importance of maintaining the lines of communication and transportation in the area of army operations. The mired motor truck carrying supplies to the front or the infantry marching in a channel of mud, are alike inimical to victory. In fact, we here in America have seen that highways far removed from the field of battle played a contributory part in the industrial activities of the nation, upon which our armies were dependent. But unlike road work in a country free from hostile attacks, the road work in France in the area occupied by American troops presented many problems of a strictly military character. Much work had to be done under the cover of darkness and lights and fires could not be used. Traffic was incessant and heavy and mud holes formed were much larger than those road builders were accustomed to. Stone was hard to obtain and still more difficult to transport. And having repaired a road, there was no way of telling whether it would last an hour or a month. The heavy traffic or the shells of the enemy would destroy it sooner or later. In spite of all the difficulties which confronted our engineers engaged in road work, the following facts from the Historical Report of the Chief Engineer, American Expeditionary Forces, show clearly the magnitude of the work and how well our engineers responded to the call of action.

The construction and maintenance of roads in the war area of France by the A. E. F. was originally under the direction of the director general of transportation, who was intended to control the construction and operation of all

TROOPS OF THE 304TH ENGINEERS REPAIRING A ROAD WITH STONE OBTAINED FROM SHELLED BUILDINGS ALONG THE HIGHWAY.

THE 315TH ENGINEERS COLLECTING STONE FROM DEMOLISHED BUILDINGS

THE 101ST ENGINEERS FILLING A SHELL HOLE NEAR ST. RENY. SEPTEMBER, 1918

lines of communication. Subsequently this department was restricted to the operation of railways and a separate construction department was formed and road work in the advance section was given to the department of light railways and roads. On March 19, 1918, the utilities department of light railways and roads was formed by combining the former light railways division and the former roads division of the transportation department. The department of light railways and roads originally attended to the construction, equipment, maintenance and operation of all narrow gauge railways and the construction and maintenance of roads in the territory occupied by the American forces, together with the quarrying of material therefor. After April 1, 1918, road and quarry work in the base and intermediate sections, Service of Supply, was done by the department of construction and forestry and after April 12, 1918, all light railway, road and quarry work was carried on under tactical command with departmental technical supervision. After May 7, 1918, all road and quarry work in the advance section, Service of Supply, was done by the department of construction and forestry under technical supervision of the department of light railways and roads. The duties of this department, therefore, became primarily those of technical supervision, estimating, and providing for requirements in equipment and trained personnel.

During the early part of 1918 little actual road work was done under any of these departments, activities being concentrated on works of vital necessity at that time, causing a lack of men and materials. But in Nevember, 1918, when the First and Second Armies were engaged in the Meuse-Argonne offensive, the number of men employed on road work in the First Army area was 16,346, and in the Second Army area, 10,580. In the advance section, Service of Supply, there were employed 1,334 road troops at the same time. The total employed on road work was at this time 28,260 men or about 4% of the combatant troops then engaged along that front.

All roads were of macadam construction and the necessary crushed rock was purchased from existing French quarries whenever available or was secured by the operation of local quarries by our own forces, using portable crushing plants and wagon or motor transportation. In some cases the stone from buildings demolished by the Germans was used in preparing road material.

The roads in the sections occupied by the American forces were carefully studied and necessary road work was classified under three heads: First, main lines of communication; second, minor roads utilized in distributing supplies to projects or to divisional areas where troops were concentrated; third, new roads required for the necessary communication with hospital sites, storage yards, camps, etc. The total mileage of each class of roads by sections is shown in Table I.

In each section an officer was designated by the section engineer to act as superintendent of roads and had under his supervision the necessary assistants for office work and the direction of field operations which were in general car-

A PORTABLE ROCK CRUSHER SET UP ON ROAD BETWEEN TOURS AND GIEVRES

THE 1ST ENGINEERS AT WORK ON A ROAD NEAR BARRICOURT DURING ARGONNE OFFENSIVE ried on by troops temporarily or permanently assigned for the purpose, as well as in some cases Chinese labor or hired civilian forces.

During September, 1918, the First Army area came into existence and in connection with the St. Mihiel offensive, new road construction included the Sorcy railhead road, Cumejie dumps, Sorcy warehouse-canal road, Griscourt road, Griscourt Bridge, cutoff northeast of Griscourt, Griscourt-Villers en Heye road, Belleville railhead, Andilly ammunition dumps, Ferme Boyer dump, Toul-Void road and Gudeneau dump. Resurfacing work was carried on over various projects, as well as widening. Maintenance work was also very extensive. Road troops were largely occupied in maintaining and repairing existing roads and building temporary road in the former no man's land and in the captured territory.

TABLE I.—TOTAL MILEAGES OF ROADS OF VARIOUS CLASSES IN DIFFERENT SECTIONS.

Section	Lines of communication Miles	Existing roads in projects Miles	New roads to be built Miles
Base section, No. 1	367.0	28.5	18.0
Base section No. 2	235.0	36.0	19.0
Base section No. 5	13.0	3.5	7.0
Base section No. 7	75.0	—	—
Intermediate section (east)	710.0	7.5	43.0
Intermediate section (west)	350.0	—	—
Advance section	250.0	70.0	80.0
Total	2,000.0	145.5	167.0

The First Army occupied territory west of Verdun in October and new road construction included the Froides Hospital road, Varennes railhead roads, Souilly Evacuation Hospital roads, Neuilly Ammunition Park, Dombasle Ammunition dump, Fromerville road. The Neuvilly-Varennes road was widened and 107 kilometers of roads were maintained during the month in this area. Road work in the territory occupied by the Second Army during this month included the resurfacing of 30,800 sq. meters, the widening of 20,500 sq. meters and the maintenance of 59 kilometers of roads.

In the area of the First Army in November, the road work included the widening of 37,198 sq. meters and the maintenance of 438 kilometers of roads. In the area of the Second Army resurfacing work totaled 16,228 sq. meters, widening 8,534 sq. meters and maintenance of 96 kilometers.

The largest quarry operated was opened at Rupt-sur-Marne, on April 15, 1918, with two stone crushers. The capacity of the plant was 300 tons of crushed rock per 10 hours and more than 10,000 tons of crushed stone were delivered prior to December 17, 1918. The total stone delivered from the quarries in the advance section and the army area was 193,764 cu. meters.

At the time that the division of roads took over the supervision of repairs in Service of Supply areas there were small organizations carrying on repair work but there had been no opportunity of working out a comprehensive plan and necessary equipment and troops had not been provided. On August 1, 1918, the equipment on hand was as shown in Table II.

TABLE II.—ROAD BUILDING EQUIPMENT ON HAND AUG. 1, 1918, A. E. F.

Crushers	8	Plows (rooter)	4
Compressors	6	Rollers	23
Drills	11	Scrapers (slip)	2
Dump Trucks	93	Scrapers (wheel)	20
Dump Wagons	67	Scarifiers	4
Graders	8	Sprinklers (motor)	15
Plows (railroad)	12	Sprinklers (horse)	14
Trailers	6	Tractors	7

It was expected to have an American army of nearly 5,000,000 men in France by July 1, 1919, and it was estimated that it would be necessary to employ 30,000 men in road work and requisitions were forwarded to Washington for the equipment listed in Table III.

TABLE III.—ROAD BUILDING EQUIPMENT REQUISITIONED FOR THE A. E. F.

Compressor plants, with power	120	Graders (12-ft.)	80
Drills (with hose, etc.)	480	Graders (8-ft.)	40
Drill steel (tons)	200	Scrapers (slip)	300
Decauville cars and track	500	Scrapers (wheel)	300
Crusher plants, with power	120	Plows (light)	300
Rollers (10-ton)	120	Plows (railroad)	300
Rollers (5-ton)	50	Plows (rooter)	300
Scarifiers	80	Harrows	300
Tractors, 15 to 30 h. p.	40	Dump Wagons	1000
Tractors, 75 h. p.	80	Sprinklers	120

None of this equipment had arrived in France before the signing of the armistice, but on former requisitions 17 crusher plants, with power, 23 10-ton rollers and 262 dump wagons had arrived. Much road equipment was bought from sources in France and at the cessation of hostilities the equipment in use in the Service of Supply areas was as shown in Table IV.

TABLE IV.—ROAD-BUILDING EQUIPMENT IN USE BY THE A. E. F. AT THE END OF HOSTILITIES

Air Compressors	20	Scrapers (slip)	170
Crushers	24	Scrapers (wheel)	140
Drills	38	Scarifiers	4
Engines (gas)	14	Sprinklers (motor)	2
Engines (steam)	10	Sprinklers (horse)	30
Graders	10	Tank wagons	4
Wagon loaders	2	Tractors (gas)	28
Plows	23	Tractors (steam)	3
Rollers (gas)	24	Trailers	10
Rollers (steam)	29	Trucks (dump)	88
Rollers (horse)	22	Trucks (cargo)	200
Wagons	340		

After the signing of the armistice the repair of nearly 7,000 mi. of road was undertaken and in March, 1919, approximately 100,000 men were employed on road work in France, Luxemburg and occupied Germany. From the beginning of 1919 to the middle of April it was estimated that 865,000 tons of rock had been used in road work in France and Luxemburg and 200,000 tons in occupied Germany. As rapidly as possible prisoner companies and civilian labor were used to relieve the American troops for return to the United States.

University of Michigan Offers Fellowships in Highway Transport and Engineering

The Department of Civil Engineering of the University of Michigan announces that the following fellowships are available during the collegiate year 1920-1921:

The Roy D. Chapin Fellowship in Highway Transport, providing for the investigation of an approved subject relative to highway transport.

The Roy D. Chapin Fellowship in Highway Engineering, providing for the investigation of an approved subject relative to hard surfaced roads and pavements.

Two Detroit Edison Fellowships in Highway Engineering, providing for the investigation of approved subjects relative to moderate cost country roads.

Each fellowship pays the sum of $250 with an allowance of $50 for expenses. Applicants must hold a bachelor's degree and fellows must enroll for the M. S. degree and be in residence for a prescribed length of time. Applications for fellowships should contain statements of activities and educational training and should be sent to Arthur H. Blanchard, Professor of Highway Engineering, University of Michigan, Ann Arbor, Mich., not later than Sept. 1, 1920.

Bureau of Public Roads to Study Soils

Investigation Started in Maryland Will Attempt to Determine Load Bearing Value Of Various Soils in Highway Subgrades

An investigation upon the relation of soils to highway durability has been undertaken by the U. S. Bureau of Public Roads. Samples of soils will be taken in spots in the subgrade of highways where the road has begun to fail, studies of surrounding geological conditions will be made to determine how moisture arrived in the subgrade and laboratory tests will be made to determine the physical characteristics of soils and to devise a scientific measure of their bearing value. In this investigation it is proposed to cooperate with the state highway departments and the U. S. Bureau of Soils.

Preliminary investigations have been started in Maryland on the Washington-Baltimore Road and will be continued beyond Baltimore and on other roads in the state. Samples of subgrade material have been taken and examined in the laboratory.

It has been pointed out by highway engineers that soils differ widely in their ability to support loads, particularly when they are wet. Why this is true and just what the characteristics are which make soils vary in load bearing properties is little understood at the present time. By conducting a scientific investigation in this field the federal officials expect to secure information which will be of considerable value to road builders.

Hopes to Build "Ideal" Section on Lincoln Highway this Season

Lincoln Highway Association Seeks Advice from Road Builders upon "Ideal Section" to Embody Best Principles of Construction

Planning to build an "ideal" section of road on the Lincoln Highway, as announced in the March 10 issue of "Good Roads," the Lincoln Highway Association has recently issued a large circular setting forth the scope and nature of the proposed highway. Funds have been provided for the construction of this section in which it is hoped to embody the highest standards of American road building, by C. B. Seger, President of the United States Rubber Co., and J. N. Gunn, President of the United States Tire Co. Both of these men are greatly interested in highway development and believe that by constructing, at a point where it will be seen by thousands, a section that will express the highest practical ideals of American highway engineers, they will be appreciably advancing the cause of highway improvement in this country.

In order to construct this section of highway so that it will form an "object lesson" road presenting in tangible form the crystallized opinion of our foremost engineers, suggestion blanks have been sent to many road builders in this country asking for suggestions on this plan. In this way it is expected to secure the widest range of competent technical advice. A competent board of highway engineers and road builders, the personnel of which will be announced shortly, will pass upon the suggestions made and determine ultimately this spring upon the final specifications, which will be adopted. It is hoped that the road will be constructed this summer.

The location where the section of highway will be constructed has not yet been determined, but it will be built in the open country with farm land abutting and will probably be located on some of the level lands in the western states. The roadway will not be built under conditions which are neither practical or uneconomical at other points of main highways. No extraordinary problem of drainage will be presented by the location involved and land with more than 3% grade will not be considered. Only a type of construction capable of bearing a traffic of 10,000 vehicles a day, or 2,000 tons or over, will be considered.

The form for suggestions issued by the association is to be used as a guide for desired information and may be used or not, opinions in any form being considered. As a guide to thought, the circular offers three suggestions on the construction of the "ideal" section, viz., "that our principal traffic routes should provide a paved width for two traffic lanes, a parallel road to be built a mile or two distant if traffic becomes so congested that the one highway will not suffice; or that our principal routes should provide four lanes of traffic, pavements to be built continuous for a given width; or that our principal traffic routes should provide for four lanes of traffic but the paved portion to be built in two separate strips for the purpose of segregation of traffic."

New York Construction Curtailed

No New Work to be Offered Until Material and Labor Conditions Improve—Energies of Department to be Devoted to Finishing Pending Contracts and Maintenace Work

Because of high prices of road materials and inactivity of bidding on the part of road contractors, Commissioner of Highways Frederick Stuart Greene, of New York, has announoced that no new road construction will be started this year. The energies of the New York State Highway Department will be devoted to the maintenance of existing highways and the completion of work already under contract, which includes 183 contracts involving about 600 mi. of roadway.

"It is proposed," says Commissioner Greene, "to devote every energy of the department to the completion of existing construction contracts and the maintenance and repair of our present road system."

In the letting held on April 16, which included 15 new construction projects, only 5 acceptable bids were received. Commenting upon these facts, the commissioner says:

"After a careful analysis of the situation, it is evident that it is not good business or for the best interests of the state to continue the proposed program and the Commission desires to announce that there will be no further new roads offered for construction until the situation shows a decided change for the better."

Besides the present prices for road materials which Commissioner Greene calls "seemingly unjustifiable," other causes which have led to the halting of all new work are the shortage and high cost of labor, shortage of railroad cars and uncertainty of transportation, the restriction of output in many quarries and the necessity of protecting existing contracts from labor shortage by not offering new work at advanced prices.

Road Tax Funds in Dispute in Roseburg, Oregon

The city of Roseburg, Ore., has not been paid any money from the Douglas County road funds since the law went into effect requiring the city to pay a road tax as a separate road district. Over $14,000 has accumulated in the county treasury which the county court refuses to authorize to be returned to the city, claiming that there are no county roads within the city limits. The city council maintains that the money was raised within the city limits for road improvements and will institute suit for its return.

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CONSTRUCTION TRANSPORTATION MAINTENANCE

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Copy for advertisements must reach the New York office by noon on Tuesday of the week before date of issue if proofs are to be submitted.

Copy for classified and other advertisements where proofs are not required will be accepted until noon on Monday of the week of issue.

Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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Vol. XVIV MAY 12, 1920 No. 19

SAFETY FOR ROAD USERS

The newspapers have already begun to print accounts of automobile accidents and for the next few months, especially in Monday editions, such stories will occupy a prominent place in the day's news. With many automobile accidents, probably the majority of them, highway authorities are not concerned. Some of them, however, are due to road conditions and these are of very real concern to those having control of the building and up-keep of the roads.

Most of our roads were built for a traffic very different from that they now carry. Under former conditions there was little danger from the road itself, and even under present traffic conditions there would be comparatively little danger if all users would exercise reasonable care. But not all users will be even reasonably cautious and it is manifestly impossible to enforce the regulations that would keep them so, except upon comparatively few city streets.

Under the circumstances it becomes the duty of highway officials to do everything possible to reduce to the minimum the inherent dangers of the roads and streets, such as railroad grade crossings, sharp curves, obstructed sight lines, excessive grades, and the like. So far as determined by the road itself, the factor of greatest influence upon the safety of a road is the sight line, using that term to denote not only the distance a driver can see ahead, but also the distance on either side at which he can see vehicles approaching on intersecting roads. Any reasonable expenidture to increase this distance is generally justifiable, for lengthening it will enhance the safety of all road users.

It is hardly necessary to dwell at any length upon the necessity of doing everything possible to lessen the danger from railroad grade crossings. Though this hazard can be eliminated only by grade separation, there are many things that can be done to make crossings less dangerous.

Proper attention to the sight line will go far towards making safe the sharp curves on the roads, but it is possible to still further diminish their possibilities for danger by relocation that will flatten the curve, by widening the roadway and by superelevation.

Further reduction of the dangers of the road can be secured by reducing steep grades, providing strong guard rails where needed, and erecting the right kind of warning signs and signals.

It may not be necessary to put safety first in road construction and reconstruction, but it is certain that this quality deserves a place well up in the list of the requisites of a good road.

THE "BEST" ROAD

As a general thing, engineers take too small a part in public affairs. Most of them do not seek publicity and are too infrequently in the public eye. One result of this is that engineers are not properly appreciated and their work is too little understood.

If these conditions did not obtain there would be less search for the "best" road—the "ideal" type, or the "most satisfactory" surfacing. The public is not informed through well planned publicity campaigns of some of the fundamentals of engineering—as it is of some of the main facts of medicine or law, for instance—and so, apparently, there is a widespread belief among laymen that there is some type of road that is best adapted to all conditions.

Attention has been called to this matter before and probably will be again, for it is of considerable moment to engineers and its remedy lies with them more than with anyone else.

Some years ago the subject was taken up by the Special Committee on Bituminous Materials for Road Construction of the American Society of Civil Engineers. In a portion of its report, which was printed in this column, the committee said:

"The committee deplores the tendency, apparent in some quarters, to devote time and energy to the discovery of 'the most satisfactory road surface,' and expresses its conviction that there is no such thing as a 'panacea' for all highway ills. It believes that with the development of highway work, it should be constantly more apparent that one of the greatest problems to be solved by highway engineers is the proper selection of the particular material and form of construction to be used, which most efficiently meet the conditions of any particular case, and that progress will be hastened by complete recognition of this fact."

Some progress in combating this attitude has been made during the six years that have passed since that report was presented, but in the main the conditions are about as they were. Practically all engineers are still agreed upon the necessity of selecting pavements by taking into consideration all of the conditions of the individual case, but the public still clamors for the one "best" road.

Engineers can make some headway against this popular fallacy by the right kind of publicity. And it is their duty, to themselves and to the public, to do so. As more and more people become automobile owners, the public interest in roads keeps pace. The right sort of information put before them in the right way would be seed in fertile ground. Unfortunately, however, most of the articles on roads that appear in newspapers and magazines are not of the sort to improve the popular understanding of the matter.

Naturally, engineers can do but little as individuals. But through organizations of various kinds they can do much and do it effectively. State highway departments could do a great deal by the general distribution of literature, and some of them are doing so. Societies like the American Road Builders' Association could also be used as efficient mediums for the dissemination of such information as the lay public needs.

Just how much, and what, knowledge the public should have is perhaps a debatable question, for, as in law and medicine, the application of that knowledge must be left to those who follow the profession. But it is certain that laymen should have enough knowledge of road building to realize that engineering questions should be decided by engineers.

Railroad Head Would Curtail Highway Work

B. & O. President Calls Road Building Non-Essential and Urges Council of National Defense to Divert Labor from Highways to Relieve Existing Shortage of Farm Labor

Proposing the curtailment of road building activities in order to divert labor to farm work, Daniel Willard, President of the Baltimore & Ohio Railroad, has requested the Council of National Defense to consider such action. Secretary of War Baker, Chairman of the Council of National Defense, announced that a meeting of the council would be called and the attendance requested of Secretary of Labor Wilson and Secretary of Agriculture Meredith. In the proposal of Mr. Willard, labor is to be diverted from non-essential industries, in which group road building is grouped and featured.

Farm labor shortage is very pronounced and farmers will be unable to carry out their planting programs unless labor is provided. According to H. C. Taylor, of the Department of Agriculture, the supply of farm labor is 72% below normal.

Farmers are also embarrassed by the shortage of railroad equipment to move their products. "A typical illustration of this," said Charles O. Lyman, Secretary of the National Board of Farm Organizations, "was shown recently in the resolutions of farmers of Florida, announcing their determination to reduce their acreage radically unless better car service is afforded.

"Acute as the labor situation is, I doubt whether the farmer would be willing to include road building among the non-essential industries to be curtailed as Mr. Willard proposes. The improvement and maintenance of their roads are essential to farmers in the marketing of their crops, and summer is the only time when road work can go on."

Bonus Offered To Bond Buyers

Farmers of Jay County, Indiana, near Dunkirk, finding that there were no prospective purchasers of bonds for the construction of the Buckles Road, subscribed $300 as a bonus to be given to anyone who will buy the bonds. The estimated cost of the road work is $3,000.

Plan Road into Yellowstone Park

Several meetings have been held by ranchers of the upper Clark Fork Valley, Montana, to promote the building a macaram road from Chance to Cooke City along the canyon of the stream. About 100 ranchers are interested in the project and it is hoped that federal aid money will be forthcoming for the undertaking. Abundant road material is reported to exist along the route. The proposed road will provide a new entrance to Yellowstone Park.

Contracts and Force Account Work in Ramsey County, Minnesota

Ramsey County, Minnesota, awarded three contracts for highway construction on May 7, totaling $97,229. Work on two other projects at an estimated cost of $14,912 is to be done by the county on force account because the bids received were considered too high. The three contracts awarded include 1.7 mi. of grading and surfacing with sand-clay on the Hamline Road, 1.25 mi. of concrete surfacing on the Snelling Road and 1 mi. of concrete surfacing on the Long Lake Road.

The commissioners decided not to vote the recent $250,000 bond issue for building the state roads in Ramsey County until the money is actually needed. The county has a road fund of approximately $400,000.

Cement Shortage Forces Cut in Wisconsin's Highway Program

Stocks Secured to be Allotted to Various Jobs—Plans Made for Force Account Work

Because of inability to secure a sufficient quantity of cement, Wisconsin will be able to build but one half of the 400 mi. of concrete roads included in the 1920 construction program. The state has been able to secure only 700,000 bbl. of cement and will allot this to the various jobs.

Contracts for 63.77 mi. of concrete work have been awarded, according to the monthly report of the Department of Engineering, and contractors are bidding more freely than earlier in the season.

Plans for the use of day labor on many important construction jobs are being formulated by Wisconsin and after studies on necessary plants and equipment are completed, this work will be pushed. In this work careful study will be made and records of cost data will be compiled.

Western States Spend Most Money, per Capita, for Highways

Figures Recently Compiled Show Utah at Head of List, Followed by Nine Other States West of the Mississippi

Tourists in states west of the Mississippi often condemn those states because of the condition of their highways, it is said, apparently losing sight of the fact that the country is sparsely populated. As a matter of fact, according to figures recently compiled by J. David Larson, Secretary of the Commercial Club of Salt Lake City, Utah, the per capita expenditures of the western states are greater than those of the states in the East.

Taking the figures of the Federal Government for total expenditures during the first ten months of 1919 and the funds still available for work this year and next, and figuring the per capita expenditure on the 1910 cenus, Mr. Larson shows that Utah heads the list and that the next nine states are west of the Mississippi River. The figures given by him are as follows:

Utah, $27.03; Montana, $16.75; Texas, $15.52; Oregon, $11.87; Iowa, $8.69; California, $8.41; Idaho, $6.44; Colorado, $5.93; Washington, $5.69; Minnesota, $5.36.

New England States Have Good Roads

Col. Wm. D. Sohier, the Former Chairman of the Massachusetts Highway Commission, Praises the Roads of New England States

"The New England states," said Col. William D. Sohier, former Chairman of the Massachusetts State Highway Commission, in a recent report to the U. S. Bureau of Public Roads, "contain but 2% of the area of the country, but they have more than 87,000 mi. of rural highways or 4% of the total. Connecticut and Massachusetts were the earliest to begin a comprehensive state aid system. Out of the 75,000 mi. of improved highways in the United States in 1920, some 11,589 mi. were in New England and nearly one-half of these were in Connecticut and Massachusetts.

"The main trunk lines in Connecticut have been largely constructed during the last 25 years. The roads had to be widened and resurfaced. It has been found that water-bound macadam roads with surface treatment, will not, unless upon unusually good soil or foundation, withstand heavy trucks, especially when the frost is coming out of the ground in the spring. In 1919, about 300 mi. of highway were constructed in New England, at a cost of $2,300,000 and 225 mi. of state aid roads constructed at a cost of $2,700,000."

Pavement Costs in New York State

Average Cost of Six Types of Pavement Compiled by Division Engineers of the New York State Department of Highways

The average costs of six of the leading types of pavement built in New York State vary from $22,155.56 to $52,587.80 per mile of 16-ft. pavement, according to figures made public by the New York State Commission of Highways.

The average costs in each of the nine divisions of the state are shown in the accompanying table. The costs were compiled by the nine division enginers and, according to State Commissioner of Highways Greene, they represent average costs, as of Jan. 1, 1920, in each of the several divisions. "In arriving at these prices," it is stated, "freight rates, available local materials, labor conditions, etc., were carefully considered. The prices quoted are for the pavement only, which is taken as 16 ft. in width, and 1 mi. in length. The grading, culverts, drainage, guide rail, etc., are not here considered, as this and all other work necessary to complete a highway upon any given mile would cost the same, regardless of the type of pavement selected."

AVERAGE COSTS OF 1 MILE OF 16-FT. PAVEMENT OF SIX DIFFERENT TYPES IN NEW YORK STATE, AS OF JANUARY 1, 1920

Division	Minimum bituminous pavement on sand or gravel	Minimum reinforced concrete pavement 5-6-5	Heavy bituminous pavement on clay or loam	Heavy reinforced concrete pavement 6-7-6	Mixed bituminous top on concrete foundation	Brick on concrete foundation
First	$18.671.75	$20,720.00	$23,750.00	$24,295.00	$30,472.60	$42,322.00
Second	18,000.00	22,300.00	23,000.00	25,700.00	29,000.00	45,000.00
Third	25,500.00	25,500.00	31,850.00	30,150.00	38,550.00	67,150.00
Fourth	21,400.00	26,800.00	27,500.00	31,300.00	31,500.00	51,500.00
Fifth	25,200.00	25,000.00	32,800.00	29,000.00	33,600.00	57,700.00
Sixth	18,999.00	22,306.83	24,819.00	26,399.68	27,904.54	43,926.10
Seventh	22,600.00	22,400.00	29,100.00	26,300.00	30,400.00	51,100.00
Eighth	26,503.39	30,097.27	34,256.65	35,236.90	36,734.91	58,461.13
Ninth	22,525.93	24,149.74	30,320.00	28,515.53	34,832.00	56,131.00
Average	22,155.56	24,363.76	28,599.61	28,544.12	32,554.89	52,587.80

It should be noted that the bituminous pavement is built with a 6-in. foundation course, 2-in. bottom course and 3-in. top course, giving a total thickness of 11 in. The heavy bituminous pavement has a 9-in. foundation course, a 3-in. bottom course and a 3-in. top course, making a total thickness of 15 in.

The divisions, division engineers, and the counties included in each division are as follows:

First Division: Columbia, Dutchess, Greene, Nassau, Orange, Putnam, Rockland, Suffolk, Ulster and Westchester. J. H. Sturdevant.

Second Division: Albany, Clinton, Essex, Rensselaer, Saratoga, Schenectady, Warren and Washington. H. O. Schermerhorn.

Third Division: Franklin, Jefferson, Lewis and St. Lawrence. T. M Ripley.

Fourth Diviion: Fulton, Hamilton, Herkimer, Madison, Montgomery and Oneida. R. F. Hall.

Fifth Division: Broome, Chenango, Delaware, Otsego, Schoharie and Sullivan. H. E. Smith.

Sixth Division: Cayuga, Cortland, Onondaga, Oswego, Seneca and Wayne. Wm. M. Acheson.

Seventh Division: Genesee, Livingston, Monroe, Ontario, Orleans and Wyoming C. M. Edwards.

Eighth Division: Allegany, Chemung, Schuyler, Steuben, Tioga, Tompkins and Yates. Perry Filkin.

Ninth Division: Cattaraugus, Chautauqua, Erie and Niagara. C. J. McDonough.

University of Michigan Announces Graduate Courses in Highway Engineering

During the months of Dec., 1920, to March, 1921, the University of Michigan will offer 17 graduate short period courses in highway engineering and highway transport. Each course will consist of 30 lectures and will be given in a period of two weeks and each course will count as two hours credit towards the total of 24 hours required for the M. S. degree. The courses to be given are as follows:

American and English highway transport methods, highway transport surveys; interrelationship of highway, railway and waterway transport; American and English highway traffic legislation and regulations; highway engineering financing, administration and organization; highway engineering theory and design; highway transport management, costs and record systems; highway transport seminar; highway laboratory; bituminous materials; grading machinery and operation; earth, sand-clay, gravel and broken stone roads; bituminous surfaces and bituminous pavements; brick, cement, concrete, stone block and wood block pavements; highway specifications, contracts and jurisprudence; highway structures; highway engineering seminar.

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The Director of the Good Roads Association of Japan has secured permission to translate the book by Charles E. Foote, entitled, "Practical Road Building," for circulation in that country.

MEETINGS

Calendar of Coming Meetings

May 13-15.—League of Texas Municipalities.—Eighth annual convention, Dallas, Texas. Secretary, Frank M. Stewart, University of Texas, Austin, Texas.

June 1-3.—Canadian Good Roads Association.—Seventh Annual Convention, Winnipeg, Manitoba, Canada. Secretary-treasurer, Geo. A. McNamee, 909 New Birks Bldg., Mon-

June 16-18.—North Carolina Good Roads Association—Annual Convention, Asheville, N. C. Acting Secretary, Miss H. M. Berry, Chapel Hill, N. C.

United States Good Roads Association

The eighth annual convention of the United States Good Roads Association was held on April 12 to 17, 1920, at Hot Springs, Ark. Vice President Marshall, Governor Brough of Arkansas, Governor Russell of Mississippi and Governor Larrazola of New Mexico were among those in attendance.

The following officers were elected: President, Governor Chas. H. Brough of Arkansas; First Vice President, Governor O. A. Larrazola of New Mexico; Second Vice President, R. M. Hubbard, President of the Texas State Highway Commission; Third Vice Preident, Governor Lee M. Russell, of Mississippi; Fourth Vice President, Governor T. W. Bickett, of North Carolina; Fifth Vice President, Governor Carl E. Milliken of Maine; Director General, J. A. Rountree, Birmingham, Ala.

National Highway Traffic Association

The annual meeting of the National Highway Traffic Association will be held at the Automobile Club of America, New York, N. Y., at 8:00 p. m., May 13, 1920. Preceding the business session, an informal dinner will be served in the grill room of the club at 6:30 p. m. A charge of $1.50 per cover will be made, and the public is invited to attend the dinner and take part in the discussion of the several topics to be presented.

Nelson P. Lewis, Chief Engineer of the Board of Estimate and Apportionment of New York City, will speak on "The Effect of the Motor Vehicle upon the Planning of Streets." T. A. Aspell, Manager of the Truck Tires Sales Department of the B. F. Goodrich Rubber Co., Akron, O., will speak on the "Relation of Solid and Pneumatic Tires to Efficient Highway Transport." H. Eltinge Breed, consulting highway engineer, of New York City, will speak on the "Relation of Tractor and Trailer Traffic to Highway Design."

United State Bureau of Education

The Bureau of Education of the U. S. Department of the Interior will hold a public conference in Washington, D. C., on May 14 and 15 to consider the extension of collegiate and vocational instruction in highway transportation and highway engineering. Representatives of the automobile industry, state and national highway officials and delegates from engineering colleges and societies will be present at the meeting. But three prepared speeches are to be presented and all who attend are urged to offer practical suggestions on the extension of these courses in the colleges and schools of the country.

The conference was called by P. P. Claxton, Commissioner of the U. S. Bureau of Education, for the purpose of bringing about a mutual understanding of the problems which will arise in the development of highway and transport engineering. An informal conference was held in Ann Arbor, Mich, a few weeks ago to prepare a program and at that time a resolution was passed calling attention to the need of trained men in these fields.

Secretary of the Interior Payne will be one of the guests of honor at the banquet which will be held at the Washington Hotel on the opening night of the conference.

Canadian Good Roads Association

Two sections of roadway will be constructed during the sessions of the seventh annual convention of the Canadian Good Roads Association which will be held at Winipeg, Manitoba, June 1 to 3. Several firms of Canada have offered the use of men and equipment for this purpose and delegates attending will have the opportunity to see practical demonstrations in road building. Motion picture films have been loaned to the association showing operations in the construction of various types of roads and will form an interesting feature of the program.

The president of the association, S. L. Squire, will preside over the sessions and the lieutenant-governor of Manitoba, Sir James A. M. Aikens, will formally open the convention. The opening will be followed by addresses of government representatives from the several provinces. The annual dinner and entertainment will be held in the evening of June 1.

The tentative program shows a wide range of subjects, with considerable attention being given to the proper construction and maintenance of earth, clay and gravel roads. On June 2 at 12 m. the annual meeting of the Canadian Automobile Association will be held and in the evening of the same day the annual meeting of the Canadian Good Roads Association.

Trailer Manufacturers Association Meets to Protest Against Tax Ruling

A meeting of the Trailer Manufacturers Association of America was held in Detroit, Mich., on May 7, to protest against the recent ruling of the Bureau of Internal Revenue that semi-trailers are taxable as parts of automobile trucks under the revenue act of 1918. This new ruling is directly opposite to the ruling last year which held that trailers were not taxable.

The association will attempt to obtain a revision of this new ruling holding semi-trailers taxable and if necessary, the matter will be taken to court and the validity of the recent ruling tested.

Among the speakers who addressed the meeting were Wm. E. Metzger, a director of the N. A. C. C., who spoke briefly on the possibilities of the trailer as an aid to economical transportation and an important factor in the preservation of improved highways; and Walter Wardrop, publisher of "Power Wagon," who spoke on the place of the trailer in the transportation field.

The slogan, "Truck by Trailer," was adopted and a distinctive design bearing the slogan is to be prepared.

H. W. Perry was reappointed general manager of the association for another year.

Following the business meetings, a dinner was tendered to the members and guests at the Detroit Athletic Club by the Detroit Trailer Co., and the Fruehauf Trailer Co.

American Society for Testing Materials

The twenty-third annual meeting of the American Society for Testing Materials will be held at Asbury Park, N. J., on Tuesday, Wednesday, Thursday and Friday, June 22-25, 1920. Three sessions will be held on each of the first three days and two sessions on the last. On Tuesday evening there will be an informal dance and smoker and the annual golf tournament will be held on Friday. The program includes 59 papers and committee reports.

On Friday morning, June 25, papers and reports on road materials will be presented. Committee D-4, on road materials, of which Prof. A. H. Blanchard is chairman, will render its report. A paper on "Some Relations between the Character of Steam-Distilled Petroleum Residuals," will be presented by B. A. Anderton. A paper on "The So-called Asphalt Content of Road Oils," by B. A. Anderton and D. G. Taylor, will also be presented.

Meetings in New York City to Promote "Ship-by-Truck Week"

At a meeting to be held in the Capitol Theater, New York City on May 15, in connection with the national "Ship-by-Truck and Good Roads Week," Francis M. Hugo, Secretary of State of New York, will preside and Vice President Thomas R. Marshall and Governor Alfred E. Smith, of New York are expected to be present and address the gathering. At this meeting prizes will be awarded for the best essays on the subject, "Ship-by-Truck—Good Roads."

Secretary of State Hugo is actively interested in this good roads campaign and will speak at meetings in several cities during the week.

The campaign for the nation-wide observance of this week has been carried on by the Firestone Ship by Truck Bureau, of Akron, Ohio.

Besides the tours of motor trucks starting from many of the large cities throughout the country, another feature is the award of a prize scholarship of $1,000 offered by H. S. Firestone, of the Firestone Tire & Rubber Co., for the best essay of a high school student on "Ship by Truck-Good Roads."

EQUIPMENT—TRADE—MATERIALS

Labor Saving Excavator and Loader

The shortage and high cost of labor are causing contractors to turn to labor saving machinery as a solution to many of their problems. The number of men employed to do a certain amount of work is often very greatly reduced by the use of a labor saving device. Illustrative of this fact is the case of Fred Schultz, contractor, of West Bend, Wis., who reports that he did the work of 15 men by using a Smith excavator and loader machine manned by two men. In addition to the actual saving in labor, this contractor was able to know that sufficient of his gang would show up each day to continue the work without interruption.

Operating on the drag line principle, this machine is stationed on a spot which is convenient for teams or trucks to drive up and the earth is drawn up to it by means of a cable. When the material has reached the machine it is elevated and dumped into the standing truck, as shown in the accompanying illustration. But two men are required for the operation of the excavator and loader, one man at the machine and the other to guide the digging slip.

SMITH EXCAVATOR AND LOADER

The material excavated on this job was wet blue clay with an average from 150 to 175 cu. yd. of the material being moved a day. However, when a sufficient number of teams are available the machine does not have to remain idle between loads. At one time when the excavator was working with no delays, in exactly 3½ hours it excavated and loaded 55 loads, aggregating 143 cu. yd. This is at the rate of over 300 cu. yd. per day of eight hours.

"Blawforms for Roads and Streets"

The Blaw-Knox Company, of Pittsburgh, Pa., has recently issued a booklet with 44 pages and covers, 6x9 in. in size, illustrating and describing the use of Blaw steel forms in the construction of concrete, brick and bituminous roads, curbs, gutters and sidewalks.

It is pointed out that while wood as a form material may have a lower first cost, this has always been offset by waste and the extremely high cost of form labor. With steel forms it is possible to eliminate a great part of the cost of skilled labor and utilize economically the new methods of mechanical subgrading and finishing. The various types of construction are discussed separately and illustrations of field work are distributed throughout the text.

"Saving $1,000 a Mile on Road Construction"

Bearing the above title, a booklet, 4x9 in., and containing 16 pages, has been issued by the Lakewood Engineering Co., of Cleveland, O. It is devoted to a discussion of Lakewood equipment used in the construction of concrete roads, and puts forth the contention that it is practically impossible to finish the subgrade by manual labor without leaving it ¼ in. too low. It is pointed out that the Lakewood subgrader cuts exactly to grade and saves expense, besides reducing the number of laborers from 14 to 6. Assuming that men are paid 50 ct. an hour and that it takes 13 days to finish a mile of subgrade, it is pointed out that the subgrader effects a saving in labor of $416 per mile, which, added to the saving of about $876 in concrete, makes a total saving of over $1,000 per mile.

The Patton Clay Manufacturing Co., Patton, Pa., has become a licensee of the Dunn Wire-Cut Lug Brick Co., of Conneaut, O., and will manufacture wire-cut lug paving brick.

The Vitrified Pipe Manufacturers' Association, of Akron, O., has changed its name to the Eastern Clay Products Association and has moved its offices to the Pittsburgh Life Bldg., Pittsburgh, Pa.

The Federal Crushed Stone Co., has been organized in Dallas, Texas, with a capital of $1,000, 000. Plans are under way by the company for the erection of a stone crushing plant at Chico, Texas, which will have a daily capacity of 2,000 tons.

PERSONAL MENTION

Arthur Hopkins has resigned as city engineer of Clinton, Ia.

Robert S. Wait has resigned as city engineer of Norwich, N. Y.

G. A. Russell has been elected engineer of Geary County, Kansas.

O. Leonard has been appointed county engineer of Parker County, Texas.

W. H. Nelson was recently elected engineer of Smith County, Kansas.

James G. Lott has been appointed resident engineer for Reeves County, Texas.

W. R. Schreiner has been elected county engineer of Summer County, Kansas.

C. C. Washington has been appointed engineer and surveyor of Galveston County, Texas.

Robert M. Sias has resigned his position as engineer and surveyor of Galveston County, Texas.

Herman Schroeder has been appointed county engineer of Jeff Davis and Pecos Counties, Texas.

D. J. McCoy has been appointed commissioner of the Board of Public Works of San Francisco, Cal.

D. D. Mickey has been appointed resident engineer of the federal aid road work in Jefferson County, Kansas.

A. D. Payton has been appointed city engineer and secretary of the board of local improvements, Moline, Ill.

George J. Roark, General Manager of the Beaumont, Texas, Chamber of Commerce, has been appointed city manager of that city.

H. J. Harder, City Engineer of Paterson, N. J., has been appointed a member of the New Jersey State Department of Health.

Lewis E. Kneer has resigned his position with the city engineer's office at Tacoma, Wash., and is now constructing engineer of the Hemlock Mills, Seattle.

Louis Loring, for 20 years connected with the Massachusetts State Highway Department, is now with the Boston office of the Portland Cement Association.

H. E. Bilger, formerly consulting engineer of the Monmouth Stone Co., Monmouth, Ill., is now general manager of the Highway Culvert Form Co., of Peoria, Ill.

E. G. Lewis, formerly manager of the Cleveland office of the Bucyrus Company, has been appointed central sales manager, with headquarters in the McCormick Bldg., Chicago. He succeeds E. C. Hingston, resigned. The Cleveland office will continue under the management of Mr. Lewis.

OBITUARY

T. Harry Jones, City Engineer of Brantford, Ont., Canada, died recently after a brief illness. He was graduated from McGill University in 1877 and six years later was appointed head of the engineering department of Brantford, which position he held continuously until his death.

John Bogart, formerly secretary and director of the American Society of Civil Engineers and at one time state engineer of New York, died at his home in New York City on April 23 at the age of 84 years. Me. Bogart was born in Albany, N. Y., in 1836 and educated in Albany Academy and Rutgers College, receiving the B. A. degree from the latter institution, and taking a master's degree three years later. Although engaged in the several fields of engineering at various times, Mr. Bogart, was best known for his work in public park planning in New York City and hydro-electric development along the St. Lawrence River. During the Civil War he was engineer of fortifications at Fort Monroe and other points and from 1888 to 1891 was state engineer of New York. From 1878 to 1890 he was secretary of the American Society of Civil Engineers.

PUBLICATIONS

HIGHWAY PRIMER. By R. H. Winslow, Secretary and Treasurer of the North Carolina Automobile Association, Paper, 4x6 in., 48 pages.

This booklet discusses the maintenance of gravel roads, aiming to present to the rural population the elementary principles of good roads. Road dragging and drainage are the most important points discussed. Also included in this publication are a list of officers and a statement of objects of the North Carolina Automobile Association, mileage statistics of the United States, a list of state highway officials and a list of highway and road associations in this country.

———OOO———

Clark County, Kentucky, has voted $60,000 for the reconstruction of a part of the Winchester-Lexington pike.

Prince George County, Maryland, will build a bridge over the B. & O. R. R. on the new concrete road which runs from the Washington-Baltimore Turnpike through Cottage City on the south side of the railroad. The Maryland State Roads Commission will construct and maintain the approaches of the bridge, the railroad will build the abutments and superstructure of the bridge and the surface of the road will be maintained by the county.

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Concrete Bridges and Culverts

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THE HIGHWAY CONTRACTOR AND ROAD BUILDER

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20

The Design and Construction of Different Types of Pavements*

Brick

By M. B. GREENOUGH

Secretary, National Paving Brick Manufacturers Association

To attempt more than a cataloging of brick pavement development since the last meeting of our Association is to invite all the hazards of prophecy. History is in the making and time is needed fully to appraise the significance of events. But the advances of 1919 stimulate lively conjecture as to the ultimate outcome.

The proceedings of our Association on brick paving constitute a singularly complete background for our discussion. If you will review this record, you will find repeated instances of an engineer from one section of the country discussing a given type of brick construction by the use of which his problems were solved. Another engineer, probably from a distant part of the country, describes the use of quite a different type, equally the solution of his problems. A sufficiency of such reports will be found in our proceedings thoroughly to establish of record the fact that the maximum service value of brick pavements has promoted the use of a variety of types or, conversely, that no single type of brick pavement is adequate, with economy, to meet every paving requirement.

If there has been any development in brick paving engineering in 1919 it has been toward a clearer recognition of this fact in practice. One would need to look back many years to find an equivalent period during which work built and planned included so many different types of brick pavement as that of the past year. Let us review briefly the history of brick paving touching this point to give it its proper setting.

Past Experience Reviewed

Nearly all brick pavements laid before 1895 were filled in the joints with sand or bituminous material. For many years they were laid upon natural foundations. Comparatively slight attention was paid to variable conditions of subsoil drainage and other factors in soils measuring their supporting power. Artificial bases had their inception in the belief that thus might imperfectly drained or consolidated subgrades be bridged over and settlements in weak spots prevented. The cuhion or bedding beneath the brick was primarily intended to compensate for uneveness in the surface of the base. Sand and bituminous fillers continued to be used after the construction of artificial bases became general and after functions without number in addition to these mentioned had been ascribed to artificial bases.

With fillers of these kinds, chief reliance for the durability of the pavement as a whole was placed in the wearing qualities of the individual surface units. That this confidence was not misplaced is proved by the very large numbers of these old brick pavements in all parts of the country that are now in service, many of them laid long before 1895.

At the time of which we are speaking, there had not been developed a bituminous filler that could meet the much-specified requirement that "It shall not flow in hot weather nor become brittle in cold weather." The result was that as soon as the filler had left the joints, the edges of the brick cobbled. Pavements then became noisy, naturally enough, when traversed by iron-tired vehicles. Nor could the open joints be justified in view of the increasing demand for clean streets.

The development of cement grout filled brick pavements grew out of these conditions. The hard filler, it was thought, would protect the edges of the brick. Cobbling under traffic would be prevented, and at the same time a surface promoting maximum sanitation would be provided. Moreover, it was believed that the firm bonding of each brick to its neighbor would furnish a monolithic wearing surface reflecting all the inherent service value of the individual brick composing it. Just as the sand cushion had been used with sand and bituminous fillers, it was continued in use with cement grout, purely on the basis of precedent.

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*Paper presented at the 17th annual convention of the American Road Builders' Association, Louisville, Ky., Feb. 9-13, 1920.

Many millions of square yards of brick pavement, cement grout filled on the sand cushion, were built in the period from 1895 to 1915. This type came to be regarded as the all but universal type in the East, the South, throughout Ohio, Indiana and Illinois. Of the West we shall speak later. But east of the Mississippi River this type of brick pavement almost became the single standard.

It became increasingly apparent, however, in observing this type in service, as built under average working conditions, that the sand cushion was a tricky and dangerous element of the structure. Uniform compression was the exception rather than the rule. In all too many cases, patches of the surface were broken down. The bricks themselves have given the appearance of being crushed under traffic. But it was soon discovered that the real cause was in an imperfectly compacted sand cushion. The sand would be forced into the joints from below when the surface was rolled. In many cases the filler would enter the joints only a fraction of an inch. A force was, therefore, exerted upon only a fraction of the face of the brick, sufficiently concentrated in many instances to snap off entire tops of bricks.

The sand cushion and grout filled type, which it was possible to build satisfactorily through care and watchful supervision, was finally found inadvisable for further use. The hazard was too great. It was satisfactory neither to the public, to engineers, nor to the paving brick industry.

Construction of Green Concrete Foundation Type

The solution seemed to be found in the development in 1914 of the green concrete foundation type and the semi-monolithic type of brick pavement. If the literature of the period from 1914 to 1916 is consulted, the constantly reiterated belief that the principal merit of the two types lay in the elimination of the hazard of the sand cushion will be found. That belief has been justified in the facts. It has also been proved, as it was predicted at that time, that longitudinal cracking, common to the sand cushion type in frost latitudes, while not altogether eliminated, has been reduced.

There can be no question as to the improvement effected in cement grout filled brick pavements by supplanting the plain sand cushion with a mixture of cement and sand or by laying the brick in the green concrete. It must be pointed out, however, that from the time cement filler was introduced, highway engineers had to deal with the problem of the paving slab. A condition of unsatisfactory joint filler needed to be remedied. Unquestionably, the remedy gave the desired edge protection to the brick, but it likewise introduced hazards of its own, for the relief of which we must await a more definite and complete knowledge of slab pavement stresses and strains.

The history of brick paving has been one of a continual seeking for a filler that would furnish the required edge protection to the brick, so as to form a smooth and sanitary surface and at the same time to cause the pavement surface as a whole to bring to a maximum the wear-resisting properties of the single unit.

A Filler Developed

So far, this discussion has largely covered that section of the country lying east of the Mississippi River. In the West the early improvements followed the practice of the East. Being in the field of large scale asphaltic oil production, this section naturally turned to the use of asphalt fillers. Because asphaltic oil was a native product, an effort was made to improve it for its several uses, brick paving filler among the rest. For many years there was no special ground for thinking that extraordinary progress was being made. But while the East turned from bituminous to cement grout filler, the West perservered in attempting to improve its asphalt filler.

The fillers produced showed increasing stability under high temperatures and less brittleness under low. Since 1912 an asphaltic filler that does meet the situation has been generally used in brick pavement construction. The second outstanding development in brick paving practice in 1919 has been the rapid growth in the amount of this filler used in all parts of the country and in the yardage projected for future construction.

The Standard Brick

Third among the developments of the year now past has been the increase in the use and specification of what is being styled the standard brick—namely, the 3x4x8½-in. plain wire-cut brick. Already well established throughout the West, its use has spread during the year to points east, through Illinois, Indiana and Ohio, and with respect to the absence of lugs, Pennsylvania, and in the South.

Prior to 1895 nearly all brick laid measured 2¼x4 in. in width and depth and from 8 to 9 in. in length. They were plain wire-cut and unrepressed. They were thoroughly well vitrified brick—so much so that they were sometimes somewhat irregular in shape. But they did possess beyond question unequalled wearing qualities. They were very tough and very hard. It was at about this time that agitation began among engineers for a brick of more perfect shape. The response of the paving brick industry was the brick of the so-called block size, 3½x 4x8½ in.

Coincident with the standardizing of the block size came the addition of projections or lugs for spacing. The plain wire-cut brick had done their own spacing. With the extreme regularity that was expected with repressed brick, the lugs were deemed necessary. With perhaps equal weight, the argument for foothold for animals was advanced as an additional reason. The fact that cement grout filler had come into use did not have a great deal of influence so far as lugs were concerned until engineers began to use the coarse grades of sand in the grout. It is also true that the rounded edge of repressed brick assisted, rather than otherwise, the entrance of the sand cushion into the joints from below.

Once the block size of brick began to be made by all manufacturers, there was practically no change in the size or shape of brick until 1910, when there was developed west of the river the wire-cut brick 3x4x 8½ in. in size, having two instead of four lugs formed by the die instead of being repressed. There were produced east of the river contemporaneously wire-cut lug brick that aimed to recognize the demand for the advantages of wire-cut as against repressed brick. In size no change was made from that of the repressed brick. The edges of this and the wire-cut brick west of the river were square, whereas repressed brick were round-edged. The wire-cut brick seems to be generally preferred by engineers for all brick construction. And with the passing of the repressed brick there seems also to have passed the height of the demand for lugs. They were dropped from the brick previously mentioned as having them formed by the die, more than two years ago. And in the 3x4x8½-in. size they are being increasingly regarded by engineers as superfluous.

Modern Conditions

No longer can it be said that there is a universal type of brick or other pavement. Engineers ask, "Do we use standard footlugs for all columns in high building construction? Do we use standard designs for every bridge pier, for all dams, for each retaining wall?"

The answer of course is "No." Yet these are comparable departments of engineering. Each of these structures is called upon to support loads, and each rests upon whatever soil foundation is available in each case. We must bear in mind also that each of these is a localized structure with a minimum expectation of variation in subsoil beneath it. Yet we very well know that subsoils and surface soils vary noticeably within short distances.

In spite of the precedent for individual designing thus established for structures resting upon the earth, it has been ignored to a great extent in road construction. Engineers have not insisted that subsoil and surface drainage should be made as perfect as possible.

Drainage has been neglected to the point of being ignored, as has also the known fact that soils vary within short distances and that saturated subsoils afford little if any bearing value for the pavement structure, for we have required the construction of "standard" types of pavement without regard to these conditions. It is not unusual for the same kind and depth of base to be specified for a road 12 mi. long. If the section is adequate for the worst condition, then it is extravagantly designed for every other condition.

Extravagance is not compatible with sound engineering. The fact that in one locality a brick pavement, for example, has been built on a 4-in. concrete base is not justification universally for that depth. Conversely, it does not follow that because a 6-in. base seems to be needed in one place, the same depth is required a mile away.

The time is not far distant when a single stretch of pavement will be designed in short sections. In a given contract for a single road there may be concrete base, rolled stone, gravel or slag base; each one may be anywhere from 4 in. upward in depth. If we carry the thought to its logical conclusion, there may be portions requiring no artificial base.

Individually designed roads are a necessity. The use of blanket types is wasteful. It ignores the fundamental principles upon which the character of the profession's public service is founded. It cannot endure.

As nearly correct a description of a slab pavement as we can now write is this: It is a continuous slab resting upon a continuous support of varying elasticity, to be designed to carry moving loads. As yet we have not a proved analysis of such a structure. The nearest approach to it will be found in the analysis of rail stresses, and as far as this work has proceeded it is based upon results secured by the use of an extensometer under actual service conditions.

It will also be recalled that the simple beam theory is based upon positive bending moments. There are no negative moments in a simple beam. When beam or slab continuity is introduced, however, we have set up a consideration of negative moments. Under moving loads a negative moment moves in advance and in the rear of the load and is effective in the vicinity of the support. Witness the analysis of continuous beams on fixed supports. Just what happens on elastic supports is yet to be shown.

Admittedly, this discussion is theoretical. Fortunately, we have recent data presented by the U. S. Bureau of Public Roads derived from the measurement of the effect of motor trucks upon pavement surfaces, to show that the principal force of traffic to be met is impact and not bending.

What, then, can we do while awaiting the production of scientifically determined data that can be used with the backing of proof? The answer to that question is clear. We should return to first principles. We should place ourselves upon the safe ground of minimum of hazard.

In the end, that means a much more discriminating use of cement grout filler so far as brick pavements are concerned. It means that in many cases concrete bases will be supplanted by another type—

the rolled base. It means the passing of standard cross-sections of pavement of all types. And these things mean laying the foundation of real economy in pavement design.

The coming of a saner period of pavement design is evident. Already the reaction against slab pavements is setting in, and the rolled base is in the ascendency. We should not forget that there is more than one type of rolled base. Some are water-bound, some tar-bound, some bound with dry screenings. Local stone secured by the roadside is adequate. The keynote of this type, as it should be of all types of base, is sufficient serviceability at minimum cost.

Specifications

Engineering specifications more and more recognize the principles that have been discussed above. Specifications are becoming specifications of details. There are concrete, rolled stone, gravel and slag bases bound with screenings and with tar. There are asphalt fillers and sand, cement grout or combined tar and asphalt fillers. The sand cushion will be specified to accompany bituminous and sand filler, the cement sand bed or the green concrete base where cement grout filler is used. The specifications will be published in sections. By proper selection, a type of brick pavement can be specified that will meet local conditions with economy.

To sum up the case of brick pavements at the beginning of 1920, based on the indications of 1919, we may state these points as clearly defined:

1. The value of thorough subsoil drainage is becoming realized, and is more and more being made an integral part of construction.
2. The use of a variety of kinds of bases to meet different subsoil, traffic and economic conditions is firmly established.
3. The tendency of design is away from the slab types of brick pavements and toward the types that depend upon the quality of the individual unit as against the monolithic surface.
4. Cement grout filler is being used with more discrimination.
5. The coming year may see the widespread adoption of the standard brick in localities now laying numerous varieties of lug brick.

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Interrelationship of Highway Transport and Back-to-the-Farm Movement[*]

By S. V. NORTON[†]

The highway transport movement, in its relation to rural development, is not only the movement to establish private rural motor express and parcel post systems, but the use of farmers' privately owned trucks, trucks owned on a cooperative basis, and also passenger cars and buses, owned in city and country—in short, all motor-driven vehicles using the highways.

The back-to-the-farm movement is an attempt on the part of those who realize the need of increasing our rural population and our output of food to induce men and women to leave the city or the urban community and live and work on a farm. It is estimated that 8,000,000 people have left the farms since 1900 and moved to the city, so that today between 25 and 30% of our own population remains on the farm to feed 70 or 75% who live in the city. The back-to-the-farm movement is an attempt to reduce the high cost of living by increased production of foodstuffs.

In trying to get a line on this subject, it was my endeavor to seek as many sources of information as possible. I talked with truck manufacturers, with motor trade and farm paper editors, with Government authorities, with boys and girls from farms, and with farmers themselves.

I will take up the remarks that I gathered, or the opinions that I learned, from these sources in their order. Take first what the truck makers say: Many of the truck manufacturers today have very Well conducted house organs, covering a wide range of interests. They reach not only the truck owner and prospective truck owner, but they realize the great potential business that comes from the farm. In respect to the farms, these house organs and the other comments that I have got from manufacturers, seem to classify into four divisions.

They say, put trucks on the farm; first, to save time; second, to keep down expenses; third, to produce more and to eat less, or to consume less through horses and hence have more for human requirements; and fourth, to haul for neighbors during slack seasons.

The next group say that motor trucks used by the farmer will place the farmer within easy reach of markets. They will enable him to take advantage of favorable market conditions; that is, if he knows the markets are up, he will go when he knows the going is good and avail himself of the highest market values. The motor trucks will deliver produce in better condition and will deliver live-stock with less shrinkage. They will help the farmer to overcome weather conditions, in that he can get from his farm to the city or to the market without regard to the road, because his truck is more powerful than his other equipment. They will increase his working time on the farm and will enable him to haul not only his crops and stock to the market, but from the market to the farm he can haul building materials, machinery, fuel and merchandise, in larger quantities and at reduced cost. The farmers can establish rural motor express to help where farm work will not support the truck alone. Many of the truck manufacturers say that if the farmer has not a large enough farm, let him be served by some one who can operate a truck for the community. Finally, they say, build good roads because the truck cannot successfully operate without them.

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[*] Paper presented at the annual convention of the National Highway Association and the Highway Transport conference of the National Automobile Chamber of Commerce, Chicago, Ill., Jan. 29, 1920.

[†] B. F. Goodrich Rubber Company.

Now the motor trade paper editors also have much to say in regard to the use of the truck on the farm and assisting the farmer by means of motor transportation. The high lights that I have gathered from these are as follows:

They say that highway transport will reduce isolation; they consider that the isolation of the farmer is something that it is very essential to overcome. It is interesting to note that for every 100 farms in the United States, there are 39 automobiles or trucks. I think that is going to do a great deal, as a matter of fact, to reduce the isolation, because those trucks are not going to remain idle.

The next, and perhaps the strongest, comment they make, is to build good roads. In that respect, the same as with the manufacturers themselves, they advise the establishment of rural motor express routes and they also say buy machinery, not only motor trucks, but other auxiliary machinery that will help the farmer do his work better and quicker.

"No nation has ever been able to enact legislation forcing people to remain on the farms. We are not able to do it in America. The only solution is more modern methods and improved machinery."

What do the farm paper editors say? They say put more machinery on farms so as to cut the cost of production and save labor. They advertise this machinery, so it is up to them to say something in behalf of these things. They say buy advertised luxuries. Make the farmers' homes as comfortable as the city homes. Let the farmer know the best kind of kitchen and bathroom equipment so that he can make his home as comfortable as the city dweller's. They advertise the goods which they want the farmer to purchase.

They say build good roads to stimulate trade and reduce isolation. The also say that trade markets follow the automobile. It has been argued that where a farmer is able to have an automobile, he probably has some money with which to buy other things, so the trade market will follow the car and the truck.

The next group of authorities I tried to interview and get information from were the Government authorities. Perhaps no one is more enthusiastic in respect to the use of motor equipment than the Honorable James I. Blakslee, Fourth Assistant Postmaster General. I found a paper of his entitled "Economics of Distribution Through Postal Transportation," in which he said:

"Today, production and transportation are not proportional to consumption. Complaint is general that prices of foodstuffs, commodities, and merchandise are exorbitant. Production is dependent upon the efficiency and number of producers. Efficiency in production results from experience and is more or less self-secured. The number of producers is dependent upon the returns from production. To secure greater returns from production it is essential that greater quantities be produced at no increased cost, or the same quantity be produced at less cost.

"Food, minerals, and merchandise must be transported in this country over approximately 240 mi. of airways, 15,000 mi. of inland waterways, 350,000 mi. of railways and 2,500,000 mi. of highways. One-fourth of 1% of this 2,500,000 mi. of highways is suitable for motor trucks.

"Numerous food producers, now engaged in the transportation and distribution of foodstuffs in small quantities, could be economically replaced by parcel post service. Sixty thousand parcel post carriers daily traverse 1,400,000 mi. of highways through producing territory. If each transported 2,000 lb. the amount would feed approximately 40,000,000 people. Why don't they do it? There are three obstacles; First, the highways are not suitable; second, vehicles not suitable; third, high postage rates."

Mr. Blakslee contends that even though the motorized parcel post might have to be operated temporarily at a loss, the service would afford a far greater saving than its cost in taxes to its patrons. While this theory is interesting, it is not shared by many who contend that such service, to be a sound economic factor, must be self supporting. He is an enthusiast on this subject. He believes that parcel post routes do more for the farming communities than anything else, but he says, let's go to it even though it isn't self supporting. Reports from other Government departments might be cited to show how highway transport lowers the cost of living. They do not, however, specify how this service would appreciably stimulate the return of workers to the farm.

I went to the farm sources. I sought those first who had come from the farm, the young fellows and the girls who had sought to find a better way of living and one that was more satisfactory to them. I found that the boys said, "Nothing doing on the farm for us. We're through. We want better wages such as we can get in the city, shorter hours, more excitement and something doing after we get through." The girls said there was less drudgery in the city, less isolation and loneliness.

Most of them went into the factories where they could be with their friends and have some definite hours, so they could have their evenings free. They said there was more fun in the cities, more dances, movies and things of that kind, which were more interesting than the dull life on the farm, so it was not surprising to me that they preferred to live in the city in view of their interests. Of course, it is the young people who later on make the mature farmers who have to make up the bulk of this back-to-the-farm movement, if there is to be such a thing.

The farmers themselves that I talked to, smiled at the trade and farm papers because they say they are edited by the city fellows and do not understand the country. They say, "There may be such a thing as a back-to-the-farm movement, but we are not familiar with it if it exists." They were rather inclined to look with more or less misgiving at the utterances of these papers which attempt to cater to the farmer's point of view. They say that machinery helps by reducing difficulty of farm work and shortening hours of labor. They also say that time is lost frequently when machinery gets out of order.

Some of the farmer's problems were exceedinglly interesting to me. They are of such a nature that I am going to run through a few of them, because they have a bearing on my conclusion. In the first place, the activity of the farmer is dependent, to a large extent, on the nature of the weather. He has to do certain things when the weather demands it. For instance, when his crop of peaches is ready, he has to be ready to move it. If there is a wind storm at night, he has to be ready to protect his crops, which otherwise would be ruined. I could tell you innumerable details that the farmer has been up against. There is the Sunday work and the care of stock which must go on whether the farmer wants to give his attention to it or not. The days off for help which he has tried to work out, have not been wholly satisfactory on account of the weather and the difficulty of getting away.

The farmers felt that the question of good roads had two sides. They said that although it helped notably in getting the produce back and forth, it also presented a problem which they never had before, namely, that the automobiles make for restlessness on the part of the farmer's help and the farmer's family. The hired help want to go as much as they can, and particularly if the automobiles are available they are disposed to go, and it makes for disruption of his labor force. That, of course, is a question of mismanagement.

One of the chief problems, I think, on the farm, is loneliness of the farmer's wife. Many of the men I have tallked to have indicated to me that the farmer's wife very frequentlly is not even a partner in the business. She is more in the nature of a slave, a drudge, rather than a companion and helpmate in the business of farming. The records of the insane asylums will show a greater proportion of inmates from farming communities than from suburban communities, due to the drudgery and the terrific loneliness.

The farmer says there is need of education. "We need to have education in domestic economy in the home, school and church. We ought to have better farm papers and city papers." Schools are needed. It is a sacrifice to send the children away to school. The passenger bus may, in time, solve that.

There is the problem of undesirable farmhands, those who are loafers and feeders and who sometimes exert a bad influence over the children. I feel that these factors must be taken into consideration if we are going to have anything like a back-to-the-farm movement.

In respect to the possible benefits of motor express from the point of view of the farmer, he says: "What are we going to do with respect to selling our produce? Is there any point of collection where it is going to be taken and disposed of at a profit to us? Who is going to look after our interest?" He insists on a central distributing point and a central purchasing point. He considers this very necessary for the benefit of rural motor express.

I asked these farmers for suggestions as to what they would like to see done to remedy it. They said, "Let us have fair treatment of rural problems by the city press. Get your city press to refrain from the use of the words 'Rube' and 'Hayseed,' and those things which have a tendency to make the farmer feel that he is not as dignified and valuable as the city man. Let it be distinctly understood and played up as propaganda that the farmer is a business man with a highly respected vocation."

I think the motor trade papers are coming around to that point of view, but the city press has not arrived at that point as yet.

The main problem, however, from the point of view of the farmer is that if you are going to have anything like a return of the men to the farm, there must be developed a love of simplicity and rural life. The farmer must have a well developed scheme of things. He must realize that he must work hard, day and night, but that he will have certain compensating features he would not have in the city. He will have the outdoors and the fresh air, nature, birds, trees, squirrels, streams, butter and eggs and fresh things that he would not get if he lived in the city. Let us develop entertainment and competition among the young folks. They are as much interested in doing something better than their neighbor as the people who live in the city.

Now a word as to the general conclusions that I have arrived at. I have no doubt that good roads will stimullate transportation and be a great factor in the better understanding and better relationship between the farmer and the city dweller. I conceive

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GOOD ROADS
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Copy for classified and other advertisements where proofs are not required will be accepted until noon on Monday of the week of issue.

Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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INDIVIDUAL DESIGN

A very important point in road building is emphasized in the paper on brick paving that is printed on other pages of this issue. It is, in the author's own words, that: "Individually designed roads are a necessity."

As is pointed out in the paper, road building is a branch of engineering in which standardized construction has been carried too far. Blanket specifications for various types of pavements have been prepared and followed without much regard to local conditions. Wearing surfaces of certain materials, mixed in certain proportions, and laid in certain thicknesses, have been used for widely varying traffic and under greatly differing climatic and other conditions. There has been a similar tendency in the use of foundations, in the grouting of block pavements and in a multitude of the details of construction and maintenance.

This practice has resulted in great waste through the building of unnecessarily expensive pavements and of too cheap pavements. Mr. Greenough believes that the time is not far distant when a "single stretch of pavement will be designed in short sections." When that time does come, the taxpayers will have better roads at less cost.

SHIP BY TRUCK WEEK

The practical demonstrations of motor trucking that are scheduled in various parts of the country this week should go far towards crystallizing public opinion for good roads. And the extent to which they do accomplish that purpose will give the true measure of the success of "Ship by Truck—Good Roads Week."

Every day since the United States entered the World War has served to bring home to the American people the possibilities of the motor truck as a freight carrier. The volume of shipping originating from the forced production of war supplies and the inability of the railroads to carry the freight caused shippers to turn to other means of hauling. And the continued inadequacy of the rail carriers is still making the use of the truck imperative. In many sections the shipping of certain commodities is no larger a matter in which the shipper has any choice; he must ship by truck or not ship at all.

These conditions have naturally focused the attention of shippers upon the roads. The man who doesn't drive a car may not feel particularly interested in road improvement. But as soon as he is brought into close contact with truck shipping he realizes how essential good roads are to the business and commercial life of the country.

It is likely that comparatively few people realize how extensively the motor truck is used as a freight carrier over long distances. The demonstration tours of this week ought to increase the popular understanding of the dependence of business upon the truck and of the truck's dependence upon good roads.

AN UNWISE PROPOSAL

While Good Roads entertains the highest regard for Daniel Willard as a railroad president, it cannot see any merit in his proposal that road building be curtailed in order to divert labor to farm work.

Granting the very real necessity of increased production of foodstuffs, it is not felt that curtailing road work would greatly increase the available supply of farm labor. Nor is it of any great benefit to increase production while the facilities for distribution are so inadequate.

In many agricultural sections there is an enormous wastage because of inability to market the crops. So great is this loss that could it be eliminated the cost of foodstuffs would be very materially lowered. But this loss will continue until the roads are improved. Production alone is not sufficient; there must be a way of getting the crops from the producers to the consumers.

Better distribution is not the only means by which good roads would increase the available food supply and bring lower costs. No other factor can have so great an influence in bringing people back to the farms, for nothing else can so effectively decrease the disadvantages and increase the advantages of farm life.

Road building should never have been classed as "non-essential" and there was never so much reason for putting it in the essential class as there is at the present. It is to be hoped that Mr. Willard's suggestion will meet with the disapproval it deserves.

Interrelationship of Highway Transport and Back-to-the-Farm Movement

(Concluded from page 256)

of the problem as differing in different sections, but certainly in points where there are cities now, and good roads leading out from those cities, we are going to see an expansion of the urban community. We are going to see the back-to-the-farm movement in a changed environment. The man who has been content to live in a small environment is going to buy five or ten acres. Between Akron and Cleveland it is very hard to draw the line between the city and the country groups, because every little while you find a house of a very fine character situated near the highway, and you wonder whether a farmer lives there or a city man. I expect to see suburban developments along that line.

I feel that the farmer is right when he says that the farmers themselves must cooperate with respect to buying, production, transportation, selling, etc. Production must increase by improved methods, by better management and by better wages. Risks must be reduced through control of drainage, moisture, etc.

In general, men and women will go back to the farm only when living conditions are thought to have equal advantages on the farm as compared with the city.

Good Roads Plank Urged for Platform of Each Political Party

The Federal Highway Council of Washington, D. C., has sent a request to all members asking that representatives on national and advisory committees of the several political parties be requested to work for a plank calling for the creation of a federal highway commission of five members, a national system of highways and the continuance of federal aid.

The proposed federal highway commission would take over the present activities of the Department of Agriculture in the expenditure of federal aid money. The country would be divided into five districts under this plan, each district being under one commissioner who would personally study conditions for highway development in his territory.

The establishment of a national system of highways as proposed by the Federal Highway Council to be incorporated in the platforms of the various political parties, would include the selection, construction and maintenance of sufficient mileage to provide two roads crossing each state. This work would be carried on under the direction of the federal highway commission.

Lower Freight Rates on Road Materials Sought by Little Rock

The Good Roads Bureau of the Chamber of Commerce of Little Rock, Ark., has filed an intervenor in a case now pending before the Arkansas Corporation Commission, asking for reduced freight rates on sand, gravel, crushed stone and other road building materials.

When the railroads were under Government control, the reduced rate of 1 ct. per ton was in force, but was discontinued on the return of the railroads to private ownership. The railroads have declined to reinstate these rates.

Highway Finance in New York

State Comptroller Travis Prepares Review of History of Highway Financing in State

A brief review of the financial history of road building in New York State has been prepared by State Comptroller Eugene M. Travis. During the first century of the state's history, according to this report, road work was undertaken by the localities in which the roads were situated, with the exception of the turnpikes which were operated by private companies chartered by the state and on which toll was levied upon the traffic.

In 1898 a departure was made from local road control and laws were passed providing for a division of the expense of road work between the state and the locality. In 1905 an amendment was made to the state constitution authorizing the issuance of bonds by the state to the amount of $50,000,000, payable in 50 years. The first $1,000,000 was issued at 3%, but owing to adverse bond market conditions obtaining at that time, the rate was raised to 4%. An annual appropriation is made out of the general funds to provide for the highway improvement sinking funds.

In 1912 an act providing for a second issue of bonds to the extent of $50,000,000 was approved by a referendum vote of the people. Of this amount, $20,000,000 was designated for use on state highways and $30,000,000 for county highways. Of this second bond issue, $23,000,000 still remains unexpended, although practically pledged for payment.

Because experience has shown that many of the roads constructed by the state wear out before the maturity of the bonds issued to pay for their construction, Comptroller Travis proposed an amendment to the state constitution limiting the life of highway bonds to the contemplated life of the improved road. This amendment has been ratified and is now a part of the state constitution.

"To manage successfully such a stupendous public work as the improvement of our highways," says the Comptroller in concluding his review, "necessitated the devising of comprehensive plans requiring a term of years for its fulfillment. Moreover, intricate financial problems have been involved even so far in its successful completion. But public utilities, such as our good roads, affect so intimately the life of every one in the community, that their proper construction and maintenance are of vital importance."

Virginia Road Organization Will Show Highway Needs in Film

Production of Educational Motion Picture Film Undertaken by Virginia Good Roads Association to Awaken Interest in State

Planning to launch a highway educational campaign in Virginia, the production in a short time of a motion picture film entitled "Virginia's New Hour," is announced by the Virginia Good Roads Association. In this way an effort will be made to place before the public the vital necessity of improved roads. The film has already been contracted for, according to General C. C. Vaughan, Jr., President of the Virginia Good Roads Association, and is being produced under the authorship and direction of James W. Brooks, Director of the Educational Bureau, Federal Highway Council, Washington, D. C.

Edwin T. Meredith, Secretary of Agriculture, and Thomas H. MacDonald, Chief of the United States Bureau of Public Roads, are to be among invited guests at the premier exhibition of "Virginia's New Hour," at Richmond, the date of which will be announced later.

"For years good roads advocates," says General Vaughan, "have talked about what better highways will do. In 'Virginia's New Hour' we propose to show the modern road in action and to demonstrate its beneficial effects not only upon our commercial and industrial activities, but upon the whole range of life—social, religious and educational, taking in all walks of high and low degree.

"One of the fundamental points we are striving for is to turn the tide of youth back to the farm. We realize the magnitude of the task we have assumed, and we hope to set in motion forces that will in due time result in placing a check upon the disproportion between the progress of the cities and that of the fields between that of agriculture and that of industries. As we see it, the old type of earth road is at the bottom of the trouble and we hope by 'Virginia's New Hour' to bring the people of Virginia to a new and higher conception of what the road means to their prosperity and happiness and to the future development of our state."

Maine Has $4,000,000 Highway Program

The road program of the State of Maine includes the expenditure of $4,000,000, according to the statement of Philip Deering, a member of the Maine State Highway Department, made at a recent meeting of the Rotary Club of Portland. When the present plans for road work are carried out, the state will have 880 mi. of macadam roads.

A number of bridges will also be constructed, the largest of which will be between Portsmouth, N. H., and Kittery, Me., to be built at a cost of $2,000,000. Bids for this bridge will be asked for about August 1.

Highway Work in Kentucky

Contracts have been let for all federal aid availabe to Kentucky, with the exception of $340,297. The completion of the 18th St. Road, Jefferson County, is expected to nearlly cover this balance of available federal aid funds. Work now under construction or contract and projects approved will add 50% to the mileage of paved roads in the state. At the present time about 80 mi. of the roads of the state are paved.

Among the federal aid projects approved are 39 mi. on the Midland Trail, 11 mi. on the Eastern Dixie Highway, 3 mi. on the Western Dixie Highway and 7 mi. on the road between Winchester and the Virginia state line.

New Jersey Legislature Passes Vehicular Tunnel Bill

Legislature Overrides Veto of Governor Edwards and Proposal Will be Submitted To Voters of State at General Election

The proposed vehicular tunnel between Jersey City and New York City has opened up several avenues of controversy. The cost of the structure, the materials of construction and the capacity have all been subjects of heated discussion. The latest development in the matter is the action of the New Jersey Legislature in overriding on May 11 the veto of Governor Edwards of the bill providing a plan for financing New Jersey's share of the cost of construction.

The bill, which also carried provisions for financing New Jersey's share of the construction of a bridge over the Delaware River between Camden and Philadelphia is now a law, but will not become operative unless the voters of the state ratify it at a referendum at the general November election. The measure provides for a bond issue of $26,000,000, with a direct state tax as the means of raising the annual interest charges of $1,600,000 on the bonds. As originally passed by the Assembly, the bill provided that interest charges should be met by general state funds, but was amended by the Senate so that the tax plan should be the method of meeting this yearly expense. It was because of this feature that Governor Edwards vetoed the bill.

HIGHWAY TRANSPORTATION

Rapid Growth in Trailer Business

Business in First Quarter of 1920 Equals that of All 1919—Factories Behind on Orders—Makers Expect Steady Increase

As many trailers were manufactured and sold during the first three months of 1920 as during the whole of 1919, according to a recent statement from the Trailer Manufacturers Association. It is further stated that the production would have been still greater if the manufacturers could have secured deliveries of parts and materials and could have shipped the finished machines. The demand for trailers has shown a satisfactory increase during the past six months and the manufacturers confidently expect a steady increase in volume of business.

H. W. Perry, General Manager, and H. C. Fruehauf, Vice President, of the Association recently made a three weeks' trip, visiting factories from New Hampshire and Massachusetts to Illinois and Wisconsin. They report great activity in the industry and a general feeling of optimism. Several companies have recently reorganized, with new and additional capital; several have moved into new and larger factories; others are building new plants, and still others are planning extensions this year. Some new companies are also entering the field.

"The factories are behind on orders from four to six weeks and in some cases from $200,000 to $300,000," the statement continues "because of inability to secure deliveries of axles, springs, bearing, castings, forgings, and even bolts and other small hardware. Severe winter storms, freight embargoes and the recent railroad strike have prevented or greaty interferred with shipments of finished trailers during the winter and early spring. Despite these handicaps, shipments have increased each month, and as shipping approaches normal again the production will rise proportionately.

"Manufacturers are well satisfied with the sales situation, as, if orders had come in faster, they could not have been filled under conditions that have prevailed. As it is, the factories have had time to make provision for increased facilities and production to take care of the greater volume of sales expected.

"Buying is distributed all over the country and in foreign countries. Most of the companies report numerous export sales, to Europe, South America, Africa and the East Indies. The Texas and Louisiana oil fields are taking large shipments of pipe trailers; the Southeastern States are buying many logging trailers and the Pacific Coast is an active market for all types for commercial hauling, logging, etc. Municipalities and contractors in the East, South, Central and Western States are taking large numbers of slow-speed, bottom-dump trailers for road construction work and high-speed, side-dump, drop-frame trailers for ash and garbage removal. There is also a steady demand among farmers and small merchants for the light, two-wheel trailer for use with passenger automobiles. Even the camping trailer manufacturers are behind on orders and two or three companies are preparing to put new camp trailers on the market this spring."

Motor Truck Will Develop Far East

Head of the Four Wheel Drive Auto Company Says Truck Transportation Will be One of the Chief Factors in Industrial Progress in China and Other Far Eastern Countries

That the motor truck will prove to be one of the strongest factors in promoting the industrial development of China and other countries of the Far East is the prediction of W. A. Olen, President of the Four Wheel Drive Auto Co., of Clintonville, Wis.

"There is every indication that the motor truck will be the means of broadening the scope of industrial activities in these countries," Mr. Olen said in a recent statement. "While road conditions in such countries as China and India are anything but favorable, past experiences show that this is one of the obstacles the truck overcomes before it branches out commercially. Some of the live Far Eastern firms and cities are realizing this and as a result are bending every effort to improve their highways. In this work, the truck is already proving its worth. With labor plentiful and cheap, these projects are being rushed to the utmost.

"For some time, agents of various Chinese companies have been studying the motor truck transportation system in this country and when their reports are brought back and action started, motorized China will not be many years away. So far, these developments have been mostly an effort to solve the passenger transportation problem and short-haul work, but with improved road conditions long distance motor truck transportation will inevitably result. With the growth of the truck industry in these countries can be visualized the increased industrial activity which goes hand in hand with the opening of new markets through reliable and efficient means of transportation."

Comparative Horse and Truck Hauling Costs

A road contractor while hauling crushed stone on a state aid road job, according to the Oklahoma Highway Bulletin, employed seven teams and drivers and one 3½-ton. motor truck. The teams each hauled three loads of 1½ yd., a total of 4½ yd. per day and the truck hauled 33 yd. each day. Comparing the cost of teams and drivers at $7.25, making a total amount of $50.75 per day, and the operating cost of the truck, which handled more material than the entire seven teams at $18.40 per day, the contractor saved $32.35 daily in operating the truck. The distance of the haul was 4½ mi. each way, or a total of 9 mi. for each trip.

New Motor Vehicle Laws of New York

Eight new motor vehicle laws have been placed upon the statute books of the state of New York, all going into effect immediately. Two of the new laws were signed about a month ago by Governor Smith, but the most of them received favorable action by the executive at the close of the legislative session. The most important laws are as follows:

The Ferris measure prohibits the use of trucks and trailers, operating outside of cities, with a width of more than 8 ft., a height of more than 12 ft. 6 in., and a total weight of more than 25,000 lb.

The Gillett measure provides that all motor vehicles must be equipped with approved lights before they can be registered. This law also requires that the name of the lens or light controlling device with which the machine is equipped, shall be stated in the application for a license.

New York Merchants Will Use Trucks to Fight Truckmen's Union

Six big commercial organizations of New York City have designated a trucking committee to fight union truckmen and truck owners for the restoration of normal transportation facilities in the city. An independent trucking system will be formed under the direction of Col. Frederic A. Molitor and about 400 motor trucks will be brought into use.

It has been charged that the present transportation facilities are being used for union concerns exclusively and that the congestion of freight in the city is much greater than the public thinks. Affidavits of officials of the trucking unions are said to show that the union organizations have pledged themselves not to move any goods of firms not recognizing union labor.

Truck Overloading

Operators of motor trucks are cautioned not to overload their trucks in a circular recently issued by the Pierce-Arrow Motor Car Co., of Buffalo, N. Y. While a truck will carry more than its normal rated capacity, such practice invites inevitable loss by shortening the life and decreasing the range of activity of the truck.

Overloading increases the stresses in the weight carring members and may cause excessive breakage of these parts. A truck frame may be compared with a bridge. When a bridge is rated at a certain number of tons, it means that it can carry that load with a certain margin of safety. It will carry more, but the margin of safety which was provided to take vare of its depreciation in normal service will not be as large. The same is true of the truck.

Overloading decreases the ability of the truck to negotiate road conditions since there is a greater weight to be moved per unit of engine power. A result is excessive consumption of gasoline and slower operating speed and hence, decreased efficiency.

High Fuel Costs Confront Motor Transport

An important problem in the field of motor transportation is the steadily increasing price of gasoline. That there will be no relaxation in the upward movement is freely predicted by persons well cognizant with the facts of the situation. At a recent meeting of the National Petroleum Congress in Chicago, one representative predicted that gasoline would probably be selling at 40 ct. per gallon within a year, while others predicted that the price would go to 50 ct.

The necessity of protective measures was urged if the country is to escape the condition of an oil famine with almost prohibitive prices. Gasoline consumption has increased in much greater proportion than the production of petroleum. The number of motor cars of all kinds in the United States at the end of 1919 was estimated at 7,500.000 an increase of 23% for the year, while for the same period gasoline production showed an increase of only 9%.

Two and one-half million motor trucks will be in operation in 1930, according to an estimate of A. G. Hebb, of the Patriot Motors Co., Lincoln, Neb.

Motor truck sales during the last six months of 1919 totalled $227,695,328, according to reports of the Bureau of Internal Revenue. The 3% tax levied for this period amounts to $6,830,859.

The Pennsylvania State Highway Department announced on May 13 that the receipts of the Automobile Division up to May 4, 1920, were $6,127,864, an increase of $1,012,711 over the total receipts for the year 1919. The licenses issued for passenger cars to May 4, 1920 were 413,771 against 342,451 for the same period last year. The licenses issued for trucks to May 4, 1920 were 39,909, as against 32,302 for the same period in 1919.

New York State will issue about June 1, a booklet for motorists which will contain the recent amendments to the motor vehicle law. The copy is now in the hands of the printer. It is the plan of Secretary of State Hugo to send considerable numbers of the booklet to the various automobile clubs and organizations in the state. The booklet will also contain a list of all lenses and light controlling devices which have been approved by New York.

MEETINGS

Calendar of Coming Meetings

June 1-3.—Canadian Good Roads Association.—Seventh Annual Convention, Winnipeg, Manitoba, Canada. Secretary-treasurer, Geo. A. McNamee, 909 New Birks Bldg., Montreal, P. Q.

June 16-18.—North Carolina Good Roads Association.—Annual Convention, Asheville, N. C. Acting Secretary, Miss H. M. Berry, Chapel Hill, N. C.

PERSONAL MENTION

J. G. Blaine Potter has been appointed superintendent of public works of Jamestown, N. Y., to succeed Chas. J. Jenner.

James R. Valk has severed his connection with the U. S. Asphalt Refining Co., and is now sales manager of the Asphalt and Road Oil Department of the Carson Petroleum Co., of Chicago, Ill.

C. T. Fisher has resigned as assistant engineer in the New York State Department of Highways to become associated with the Morgan Engineering Co., of Memphis, Tenn. Mr. Fisher has been with the New York department for the past 16 years and for several years has had charge of the Jamestown office.

Edward C. Dollard has resigned as assistant engineer, New York State Department of Highways, to become city engineer of Jamestown. N. Y. Mr. Dollard has been in the Jamestown office of the department for several years and has been in direct charge of a considerable amount of highway work near that city.

PUBLICATIONS

T N T AS A BLASTING EXPLOSIVE. Circular 94, U. S. Department of Agriculture, Bureau of Public Roads, Paper, 6x9 in. Illustrated.

Upon the cessation of hostilities enormous quantities of trinitrotoluene which had been made for war purposes were on hand in this country. Because of the relative insensitiveness of this explosive as compared with the standard forms of dynamite in industrial use, its disposal was a problem. However, experiments carried on by the Bureau of Mines, which are recorded in this paper, show that T N T produces satisfactory results when used with a No. 8 detonator. Several millions of pounds of this explosive have been distributed to the various departments of the Government, including the Bureau of Public Roads, for use in Government projects.

ROAD PROBLEMS IN THE OZARKS. Paper 6x9 in., 72 pages and covers, illustrated. Second edition, enlarged. Published by the School of Mines and Metallurgy, University of Missouri.

The general principles of the contruction and maintenance of earth roads are outlined, together with their particular application in the Ozarks, where the population is sparse and land values small. Many of the roads are particularly badly located and must be changed with the development of the country. The soil conditions are difficult to overcome in improving the roads. Beds of hardpan must be drilled and shattered with dynamite in road construction and present one of the unsolved problems of road building in the Ozarks.

EQUIPMENT—TRADE—MATERIALS

The Eastern Road Machinery Co., of Boston, Mass., has issued a circular illustrating "International" road equipment, for which it is the New England sales representative. Several models of road graders are shown, together with stone crusher, unloading and gravel screening plants.

The employees of the Blaw-Knox Co. have started a monthly publication called "Blaw-Knox Life." This paper is devoted to the interests and activities of the employees of the company and contains 16 pages and covers, 7½x11 in. The first two issues have appeared and contain many interesting notes and illustrations.

———ooo———

Warren County, Pennsylvania, has decided to build no roads this year on account of the high costs. Earlier in the season the commissioners asked permission of the Pennsylvania State Highway Department to undertake the necessary road work themselves, but the request was not granted, being inconsistent with the laws of the state.

The Washington, Great Falls & Dranesville Highway Co., of Virginia, has applied for a charter in that state to construct and operate a turnpike in Fairfax County. The road will extend from Langley to Dranesville, with a branch extending to Great Falls. The estimated length of the road in 11 mi. and the company is capitalized at $50,000.

The New York State Highway Department has prepared a map, 3x5 ft. in size, showing a connected and completed highway system for New York State. Copies of this map have been sent to officials of the various counties of the state with the request that the boards of supervisors study and discuss the matter and send their expression of opinions to the Highway Department. In this work it is expected to receive suggestions for changes in the highway system which will result in larger benefit to the state and the counties.

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constant labor of repair,
Roads pleasant and swift to travel,
Roads clean and safe and paved,
Leading to great cities and friends and business and
on adventurous, delightful journeys,
All over this broad, beautiful land.
He saw himself and his wife going and
returning over these fair highways,
Making trips to town for shopping or pleasure;
He saw his boys and girls going to better schools,
and better satisfied with their home;
He saw an end to dreariness and monotony
and isolation;
He saw his produce carried quickly to market, and
anything he needed brought as quickly
back to his own door;
He saw happiness, comfort and prosperity in that
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resourcefulness and courage are today
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Effect of Car Tracks upon Traffic Capacity of Roadways*

By GEO. W. TILLSON†

There is probably no one thing that is the source of so much trouble and annoyance to the official in charge of the maintenance of street pavements or road surfaces as the existence of street car tracks in those surfaces. This is mainly true because he has no direct control over the repairs required to keep the tracks in good condition. As a general rule, the street car companies must keep in good repair the tracks and pavements between same as well as for a short distance outside. It is generally provided also that, if the corporation does not do this, it may be done by the municipal authorities. But the procedure is such, and so much red tape is involved in carrying out the legal requirements, so that the cost of repairs may be collected from the company, that the provision is seldom resorted to and it is generally considered better policy to try to have the necessary work done by the corporation itself.

While, as has been said, the existence of car tracks in streets and roads is annoying, the public authorities accept the fact that they are necessary. Transportation is a very important factor in any community, be it large or small, whether a city or a state, and it does not seem proper that existing routes of travel should not be made use of wherever possible. It may be said, of course, that street car lines, especially if suburban, should secure their own rights of way. This may be true, as an abstract proposition. But it should be remembered that this involves a considerable increase in capital cost and to such an extent reduces the dividend to be paid from a certain fixed fare. This is exceedingly important at the present time when so many street car companies, both urban and interurban, are finding it impossible to meet their financial requirements with their franchise rates of fare.

The acceptance of this fact, however, does not mean that tracks are to be laid at any place or in any way as the company sees fit without regard to the public rights or needs.

A discussion of the subject of this paper must necessarily be academic to a great extent; but it is hoped that the presentation of one or two concrete cases will be sufficient to illustrate the general idea.

The principal items to be considered in this connection are: The location of the tracks, their detailed construction, their degree of perfect maintenance, the character and amount of traffic on the tracks, and the character and amount of traffic on the street or road. The question of location is perhaps the one to be most considered, as upon the location depends the importance of the other items. Its discussion, too, involves the problem of what is the best location for car tracks when they must be laid within the lines of streets or roads. The common practice with streets is to place them in the center, thus giving an opportunity for streams of traffic to move in either direction entirely independent of each other. With this arrangement it can easily be seen that the width between the cars and the curb will have much to do with the effect on traffic. In the Borough of Brooklyn, New York City, many streets with roadways only 34 ft. wide have two lines of car tracks, and some with a width of only 30 ft. In such cases the obstruction to traffic must be very great, as the distance from track to curb is only 9½ and 7½ ft., respectively, and even these distances are reduced by the overhang of the car itself. It is on streets like these that the items of construction, maintenance, amount of traffic, etc., are particularly important.

The writer has always felt that a car track should be so constructed in a pavement that vehicular traffic could pass over it diagonally, squarely or in any direction without any real inconvenience, and that it should be so maintained that it would always meet this requirement. The heavy truck traffic that is so constantly increasing emphasizes this idea. With the present standard rails and latest construction there is no difficulty in meeting what is desired. Practically all electric roads in streets or highways are operated by overhead trolleys, but in the Borough of Manhattan, New York City, where the underground trolley is used, it is necessary to have a slot half way between the rails of each track This is also true of cable roads. Such construction makes it very difficult to properly maintain or lay the pavement. The space between the slot and rail is so narrow, and so shallow over the conduit that carries the power, that ordinary pavement methods are not successful. With the same amount of care in construction and maintenance such tracks are more of an obstruction to traffic than those used with the overhead trolleys. The writer once saw, both in Brussels and also in Vienna, an underground trolley system where the slot was built in connection with one of the rails leaving the entire space between the rails unbroken. This seemed much better work from a pavement standpoint, but the engineer in charge of the railways of Vienna said it was not good for operation. Why, was not explained, but it was thought that possibly it would not permit so good an electrical connection with the car.

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*Paper presented at the annual convention of the National Highway Traffic Association and the Highway Transport Conference of the National Automobile Chamber of Commerce, Chicago, Ill., Jan. 29, 1920.

†Consulting Engineer, La Grange, Ill.; formerly Consulting Engineer to the Borough President, Borough of Brooklyn, New York City.

The Board of Estimate of the City of New York has made a rule that a double track road shall not be laid in a street with a roadway of less than 40 ft. In Philadelphia, where the streets are narrow, generally but one track is laid in a roadway, the cars necessarily having different routes to and from the center of the city.

In some cases, where tracks are laid in the center, an area is curbed especially for the tracks, vehicular crossing taking place only at cross streets or other especially provided places. This is true in a few other cities but almost generally so in New Orleans. Here the streets, as a rule, are wide, allowing plenty of room for this method as well as for the general traffic of the city. In such cases, of course, traffic is not impeded at all except as to general crossing from one side of the street to the other.

Rochester, N. Y., has one or two streets where the tracks are located just inside the curb line. On one of the streets leading out of Paris the writer once saw a similar location. In Rochester the instance noted was on a distinctly residential street, but in France it was in a small retail section.

With such a location the general street traffic would not be affected, but it has always seemed to the writer that it must be very inconvenient to the people along the line, especially if on a business street Here, however, again comes in the question of how much traffic the car lines carry and how often the cars run.

Perhaps the best example of obstruction to traffic by car tracks of which the writer has any cognizance is in the Borough of Manhattan, New York City. Central Park West is that portion of Eighth Ave. lying directly west of Central Park. This avenue, south of 58th St. is 100 ft. wide with a 60-ft. roadway with car tracks in the center. Central Park West is also 100 ft. wide, but the roadway is only 48 ft. wide and the tracks are laid on the easterly side, the nearest rail being 3 ft. from the curb, leaving a free roadway of 29.9 ft., not taking into account the overhang of the car.

Central Park West is built up on the west side with business houses on its southern end and the remainder with large apartment houses. The cross streets, too, are well built up, so that the local traffic is heavy. Previous to the introduction of the automobile, the obstruction to travel was not so great. But it can easily be seen that, with it being necessary for all pedestrians to cross two lines of vehicular traffic in order to take or leave a car, a great deal of trouble must occur. So many accidents occurred that in 1913 the Board of Estimate and Apportionment passed a resolution directing the railway company to relocate the easterly track at its own expense, with the intention of widening the roadway after this was done. It seems, however, that the tracks were located in their present position in 1897 at the request of the Park Commissioner of the City, and the Corporation Counsel advised that a court seeking to do equity might well deny the application to compel the company to again relocate its tracks entirely at its own expense. The estimated cost of the work was $352,000. Many communications passed between the city and the railway company in regard to the matter, but no physical work was ever done, and the tracks and roadway still remain as herein described. The police reports show that on this street 286 accidents occurred during the years 1910 to 1913, inclusive. In addition to the accidents to persons, the police records show that in 1913 there were 36 collisions between vehicles and 8 collisions between vehicles and surface cars. It is also stated that probably only the most serious vehicle collisions are included in the police records. No doubt the number of accidents has increased in subsequent years. In any event Central Park West has recently been made a one-way street so as to reduce the number of accidents to a minimum. In order to understand just what this means it must be remembered that Central Park extends in width from Fifth Avenue to Eighth Avenue, a distance of half a mile, and that by making Central Park west a street for south bound traffic only this distance is increased by one long block so that all north bound traffic is cut off between Fifth and Columbus (old Ninth) Avenues. This, of course, increases the congestion on all north and south avenues. North bound automobile passenger traffic, although permitted to go through Central

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GOOD ROADS
CONSTRUCTION TRANSPORTATION MAINTENANCE

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Copy for classified and other advertisements where proofs are not required will be accepted until noon on Monday of the week of issue.

Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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CURTAILING HIGHWAY WORK

In at least two states, Illinois and New York, it has been decided to curtail highway work during the present season. Illinois has abandoned its ambitious program of betterment under the sixty million dollar bond issue and New York will only complete contracts under way and take care of maintenance and repair work. A similar course is being urged in a number of other states, and counties and smaller administrative units are adopting policies of curtailment and retrenchment. And as a sort of climax, a prominent railroad president has asked the Council of National Defense to consider the general curtailment of road work in order to divert labor to the farms. This last was discussed briefly last week.

In all cases the proponents of curtailment put forth practically the same three reasons for their proposal—high costs, labor shortage, and the state of the bond market. None of them, so far as has come to our attention, has denied the pressing need of the road work they propose to hold up indefinitely.

If the policy of curtailment is economically sound for New York State and for Illinois, is it not equally sound for Pennsylvania and Ohio and for all the other states? If the building of roads ought to be curtailed, why not call a halt upon all business—upon manufacturing and upon mining, upon stock raising and upon agriculture?

On the other hand, if "production and more production" is the crying need of the times, why put highways in a class by themselves and urge that their production be limited or stopped altogether?

In order to get the right light upon the matter of road building the road must be viewed not as a single, unrelated object, but as what it really is, one of the parts—and a most important one—in the great machine of the nation's business. The improved country road must not be seen as a speedway for the automobilist or as a means for the farmer to get to town, or the city man to the country, though these are legitimate and important uses. Rather must it be looked upon as the means by which the fruits of the fields and orchards are brought to market and shipping points and by which the farmer carries to his farm the supplies he has to obtain in the town. Highways connecting cities and towns in the more thickly populated sections should not be thought of as thoroughfares for the motorist on business or pleasure trips nor for the casual moving van, but as connecting links between the component parts of the machinery of manufacturing and merchandising, between producers and consumers of commodities of all kinds. City streets must not be visualized as conveniences for the business man motoring to his office nor for the shopper "saving" by taking home a ten-cent purchase in a car that consumes fifteen cents a mile in gasoline, oil, tires, garage rent, chauffeur's salary and other items. Certainly the streets of any city are used for these purposes (and rightly), but they are also used for other purposes that mean money saved for the users and for all those who have business dealings with the users—which means every man, woman and child in the community.

Just now the country is in the throes of the reaction from a war that rocked civilization to its foundations. The high wages paid during the stress of forced production, combined with the shortage of the necessities of life caused by the prodigious waste of war and the withdrawal of millions of men and women from the production of those necessities, has raised prices to unprecedented levels. The dollar will buy only half of what it used to buy, not only of food and clothing, but also of roads. Study of existing conditions and a knowledge of what has happened in similar periods in the past holds out no hope of an immediate return to former prices. We may have reached the peak or we may not, but we can be fairly sure that the decline will not be abrupt unless there is a panic as the result of the general adoption of a policy of curtailment and watchful waiting in public and private business.

All through the war GOOD ROADS urged that there be no cessation of the building of roads; that highway programs be modified and rearranged to meet the changed conditions, but that they be not abandoned. Events proved the wisdom of that attitude.

Road building was essential during the war and it is essential now. The farmer needs roads and the business man needs them; the laborer needs them and the capitalist needs them; they are needed by every man, woman and child in the country. The railroads are almost incapacitated and even if unhampered by governmental meddling and not bled white by the avarice of labor, it will be a long time before they can be restored to their pre-war standard of efficiency. In the meantime the highways must bear a part of the burden that the rail carriers can not carry, and when the rail lines are again functioning normally they will more than ever need the highways as feeders and auxiliaries. The motor truck is established as a short-haul carrier and good roads must be provided for it.

If the building of roads is delayed long enough, it will undoubtedly be possible to do it for less money. But the roads will be worth less when built and in waiting for lower prices and more favorable labor and financial conditions there will be piled up a transportation cost and a loss because of inability to secure transportation at any price that will far exceed any possible saving.

Roads should be built and built now. They will cost more, it is true, but they will be worth more. The fact was long ago established that money put into road building of the right sort is an investment. Under present conditions the investment will be larger than it would have been a few years ago, and perhaps larger than it will be a few years hence, but the return will be proportionately greater also.

New Jersey County Engineers See Pavement Tests By Bureau of Public Roads

The members of the New Jersey State Association of County Engineers recently made an inspection trip to the experimental farm in Washington, D. C., where the U. S. Bureau of Public Roads is conducting a series of field tests on highway design and construction. The tests covering pavement wear sections greatly interested the engineers. In these tests a device representing heavy traffic was being drawn over sections of pavement under varying conditions of construction. Other experiments witnessed dealt with impact tests, in which artificial impact representing that of motor trucks, was applied to various types of pavement built in small slabs under varying conditions of drainage, etc.

The delegation was received by A. T. Goldbeck, Engineer in charge of Tests, F. H. Jackson, Jr., Assistant Engineer of Tests, and E. P. Smith, Assistant Engineer in charge of the work at the farm. The association feels, it is announced, that money necessary to carry on these experiments to completion should be provided by the Government, because the data obtained is of great value to highway engineering.

Wyoming Asks Cooperation in Highway Work

A circular letter has been sent out by D. S. McCalman, State Highway Superintendent of Wyoming, requesting contractors to cooperate with the highway department in the carrying out of this year's program. More active bidding, it is pointed out, will benefit the state by causing the competing contractors to reduce their figures.

The cooperation of the residents along a highway under construction is also asked, the letter saying that this action will stimuate bids for road work and will help to complete the highways in a shorter time than if the contractors are hindered in their work.

Effect of Cartracks Upon Traffic Capacity of Roadways

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Park, has but two outlets to the west, so that if not through traffic it must be seriously inconvenienced.

Compare for a moment the situation on Fifth Avenut south of 59th Street. This street is also 100 ft. wide and prior to 1908 had a roadway of 40 ft., with sidewalk spaces 30 ft. wide, but areas and stoops were allowed to encroach 15 ft., so that the free width of the street was only 70 ft. The Board of Estimate and Apportionment, by resolution, widened the roadway by setting the curb back 7½ ft. on each side and ordered the encroachments back to within 2½ ft. of the property line, thus giving a roadway 55 ft. in width with sidewalks 20 ft. wide, free from obstruction. The old roadway permitted four lines of traffic while the additional 15 ft. in width furnished space for two more and even this is insufficient for the traffic requirements.

The large cars of the Brooklyn Rapid Transit Co., when passing, occupy practically 19 ft. of space, 18.6 ft. to be exact. Supposing a double track line were laid in the center of Fifth Avenue: With the traffic it would certainly have, when two cars met there would be left on each side a distance of 18 ft. sufficient only for two lines of travel. In other words, nearly all of the benefits of the widening would be lost.

Prospect Park, Brooklyn, has five sides and on all of the adjacent streets there are street car tracks. With one exception the location is similar to that on Central Park West.' But on only one street, Prospect Park West, has it been necessary to establish a one-way traffic. This is because both the local street car, passenger, as well as vehicular traffic is light. During the summer a large part of passengers carried by the car lines have the park itself as an objective and they of course are benefited by having

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New Hampshire Goods Roads Association

OFFICERS FOR 1920

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The New Hampshire Good Roads Association is in a very prosperous condition and we quote from the recent address of Mr. Everett, the retiring president.

"The New Hampshire Good Roads Association has just completed the fourth year of its existence. That it has been a year of wholesome growth the report of our secretary and treasurer testifies. The membership has increased to 270, which is far beyond the expectations and even dreams of the little handful of road enthusiasts that formed the nucleus of this Association four years ago.

"The balance in the treasury shows a substantial gain over that of a year ago. The attendance at the meetings throughout the year has been particularly good, with a possible exception of the special meeting at Durham in connection with the Farmers' Institute. It has been the endeavor of our President to carry out the wish of the Association as voiced at the last annual meeting, that members of the Association be asked to prepare papers on different subjects in connection with road construction and maintenance instead of devoting the whole meeting to information talks and discussion. During the year papers have been presented by our own members on the following subjects:

" 'Care and Maintenance of Dirt Roads,' 'Maintenance and Construction of Gravel Roads;' 'Bituminous Macadam, Penetration Method;' 'Cement and Bituminous Concrete.'

"By a vote of the Association a year ago a question box was installed and you were so notified by the secretary in a printed notice sent in June, inviting all members to make use of this question box by asking questions and submitting topics for discussion. The secretary announces that the dust is thick on the old Q. B. and the cobwebs completely cover the slot in the top.

"Not a question has been submitted, not even a news item sent in. However, gentlemen, you have the question box and it is hoped that during the coming year it will be put to some use.

"I wish to thank the members of the Association for their cooperation and attendance at the various meetings throughout the year and I wish especially to thank the Secretary-Treasurer for the very complete way in which he has handled the business of the Association. The dues are practically all collected and the books are in excellent condition and I hope that the incoming President may also merit your esteem and that he will have the same hearty cooperation that I have had."

The following have been elected to membership: Active Members: George A. Blanchard, Moultonboro; Fred F. Hargraves, Concord; Charles P. Riford, Concord; Orrin W. Head, Concord; Albert A. Carr, Wolfboro; Charles A. Eastman, Ossipee; LeRoy Johnson, Concord. Associate Members: V. A. Hewitt, Boston, Mass.; Thos. J. Guay, Laconia.

The New Hampshire state highway work will have a late start this season. Continued rainy weather has delayed repairs and contracts let for asphalt mix pavements are held up on account of an embargo on some twelve carloads of asphalt now sidetracked in Maryland. Every effort is being made to have the shipment released, but until freight conditions improve and present embargoes are lifted the outlook is not encouraging.

Labor is very scarce and even where men can be hired it is practically impossible to secure teams. It is unfortunate that conditions are so unfavorable, for the state has ample funds for use this year—much more than it will be possible to spend.

The Moultonboro project of 8 mi. of gravel road will probably not be completed this season unless labor conditions improve.

Winslow & Cummings, contractors, of Nashua, have men ready to build sections of asphalt mixed top road in Hooksett and Merrimack, but are unable to proceed until the delayed shipments of asphalt arrive.

C. A. Badger, of Portsmouth, has a contract for a 10-mi. section in Portsmouth toward the Massachusetts line, but is having difficulty in finding labor.

One mile of tar penetration road in Tilton will be carried out without delay as the refined tar is obtainable without delay.

A road that is being constructed through Guilford is delayed for lack of men, but another section in Wolfboro is delayed on account of lack of teams.

Costs of highway work keep pace with the H. C. L. and contracts for work calling for modified asphalt construction between Lebanon and West Lebanon will cost about $40,000 per mile, or at least three times as much as in 1915.

A tar and gravel road in Goffstown to cost about $12,000 has not been started as it is impossible to secure laborers at any price, although the tar and gravel can be obtained without delay.

At the last meeting of the Concord Board of Public Works an increase of 15% over the present schedule was granted to the city highway employees This increase will raise the scale of the employees from $3.19 and $3.97 to $3.60 and $4.50 per day. The teamsters' pay is increased from $4.14 to $4.68.

The City Employees' Union of Manchester has asked for a general raise of 25% in wages and has requested that the new rate to be retroactive to May 1.

The City Employees' Union has decided on a complete reorganization of the working personnel of the Public Works Department.

Patrick J. Cahillane, Secretary-Treasurer of the employees' union, recently discharged as a water meter reader for the Water Works Department by Superintendent James Mendell of the latter department, has been selectd by the employees' union to effect the work of reorganization.

Mr. Cahillane has already commenced the task of drawing up a seniority list of the employees of the department and when the same is completed it is understood the City Employees' Union intends to insist that it shall be put into operation.

New York State Road Builders' Association

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Crusher Run

Bids will be received by the New York State Highway Commission, on Monday, June 7, 1920, for the repair of 19 roads.

Theron M. Ripley, former Division Engineer, has been reinstated in his position in the Department, by a write of mandamus given by Justice Hinnan of the Supreme Court.

The Barrett Manufacturing Co., of New York, was awarded the contract for furnishing 1,419,700 gal. of tar for highway construction. The bid was for $207,533. The bid of the Atlantic Refining Co., offering 469,000 gal. of road oil for $55,275 was also accepted.

The following were low bidders at the repair contract letting which took place on May 5: James P. Kelly, No. 1254, Albany Co., $71,353.50; Jesse J. Crouch, No. 1255, Oneida and Madison, $30,720.96; Harrison Engineering & Construction Co., No. 1236, Ontario, $88,625.20; Dale Engineering Co., No. 1264, Ontario, $43,696.00; Thos. F. Murray, No. 1256, Chemung, $40,183.24; Jesse J. Crouch, No. 1262, Steuben, $63,459.68; Lane Construction Corp., No. 1263, Tioga, $81,409.96; Bunce & Carl, No. 1252, Cattaraugus, $23,881.00; I. M. Ludington & Sons, Inc., No. 1259, Erie, $22,795.20.

There were 13 contracts advertised, and 9 bids were received. The work will cost the state $466,124.74. There was but little competion. Considering the high cost of labor and materials, Commissioner Greene said he was well pleased with the letting.

Government army trucks valued at $1,275,000 have been distributed to 57 counties of the state by Commissioner Greene for use in road construction. Six trucks have been assigned to each county. The old patrol system, under which one or two men with cart and horse were assigned to a limited section of road, has been abandoned. The roads will be divided into sections of nearly 30 mi., with a truck and a gang of 8 men assigned to each one.

Commissioner Frederick Stuart Greene, in a letter addressed to the Governor and the taxpayers of the state, gives seven specific reasons, why the New York State Highway Commission is compelled to defer new construction on the state's highways. Commissioner Greene states that it is not good business or for the best interests of the state to continue the 1919 proposed program. Advertisements for maintenance work will be continued, and every effort and energy be devoted to the completion of the existing construction contracts, and the repair of the present road system.

Commissioner Greene's reasons are: Shortage and high cost of labor; shortage of railway cars and uncertainty of transportation; lack of competition in bidding; seemingly unjustifiable advances in cost of materials; commercial quarries restricting the out, put, and in some instances closing down; necessity of assuring, by utilizing labor which otherwise would be diverted to new work, the completion of the maintenance program; the obligation of the state to protect existing contracts from labor shortage by not offering new work at advanced prices in competition.

At present there are 183 uncompleted contracts. These contracts are active, with approximately 600 mi. unfinished. As soon as conditions are improved and road work can be continued economically, and without detriment to the state's interests, the program of new construction will be resumed.

Massachusetts Highway Association

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Announcement

This section of the paper is open to members of the Massachusetts Highway Association for the discussion of matters directly connected with road interests. Members are requested to submit items of interest for use in this column.

Address all communications to GOOD ROADS, P. O. Box 2705, Boston.

News and Gossip

The regular quarterly meeting of the Massachusetts Highway Association will be in the form of an outing at Quincy and Hull, arranged through the courtesy of Hon. Joseph L. Whiton, Mayor, and Halsey A. Weaver, Superintendent of Public Works, of Quincy, and John Smith, Chairman of the Selectmen of the Town of Hull.

Members will assemble at City Hall, Quincy Square, Quincy, at 10 a. m., on Thursday, June 3, 1920, and will enjoy an automobile trip over the Quincy Boulevard, inspect the Victory Plant of the Bethlehem Steel Co., look over the two President Adams' estates, incidentally viewing the Quincy Shore development, and return to City Hall to meet Mayor Whiton at about 11:30 a. m. A light lunch will be served at this point through the courtesy of His Honor, the Mayor.

At noon the party will leave City Hall to visit the United States Housing Development, three projects, including about 280 dwellings, and will then be the guests of Manager Wakeman of the Fore River Works, where some 15 submarines and other war vessels are on the ways, thus giving the members a rare opportunity to get on the inside of a submarine.

At about 1 p. m. members and guests will leave the Fore River Works for an automobile trip via Weymouth and the New Higham Boulevard to Hull and Pemberton, returning to Paragon Park at Nantasket Beach, where at 2 p. m., dinner will be served.

Paragon Park, under new management, makes its initial bow for favor on this day, and if we don't form a mutual admiration society it will not be the fault of the management of the park.

The dinner will be followed by an entertainment and a thoroughly old-time cabaret. Cut out your other appointments and come.

Massachusetts is starting on its greatest year of road building in point of expenditures and the State Department of Public Works has a difficult task ahead.

The Division of Highways of this department has about completed its plans for new construction and rebuilding and it contemplates the placing of contracts that will cost in the aggregate $7,000,000. This is $2,000,000 more than Massachusetts ever has spent before on good roads in any one year, and will make possible the undertaking of a number of projects of major importance to motorists and all others who use the state roads.

Through the Federal Aid Road Act, Massachusetts will have $2,376,000 in federal money for road construction, and by the working of the law through which the state cooperates with towns and counties in construction, there will be available about $1,000,000 in town and county money. The remainder of the $7,000,000 will come from state appropriations and from the motor vehicle fees and fines, which are devoted to maintenance. There is actually considerable more money to be spent, but that will be upon road contracts that are already under way.

With this great sum available the commission has planned a road improvement campaign which exceeds all previous efforts, and which, when completed, will be a long forward step in the linking up of important sections of state highway and the extension of the system into parts of the state which have not previously been reached by first-class roads. There will be new construction and rebuilding in practically every part of the state, from Cape Cod to the New York State line, and the plans call for the construction of about every variety of hard-surfaced roads, the character of the road depending upon the country in which it is laid and the traffic which it has to bear. Following its established policy, no state road will be built less than 18 ft. wide and curves will be 21 ft. wide. This width is considered sufficient to carry comfortably two lines of traffic.

Several big undertakings have been planned, notably the rebuilding of the main highway the whole length of the forearm of Cape Cod, a new road around Leicester Hill west of Worcester on the Worcester-Springfield route, the completion of the Shelburne Mountain road on the Mohawk Trail route, a new bridge in Billerica on the Boston-Lowell road, another bridge to cost $70,000 in Huntington, more work on the Newburyport Turnpike and the rebuilding of the Boston- Worcester road on both sides of the grade crossing in Wayland.

The Cape Cod project is one of the longest that the state ever has undertaken at one time. The present road, built at different times, is from 12 to 15 ft. wide and is inadequate to care for the heavy summer traffic, also being in poor shape in some sections. The rebuilding will be over the entire 24 mi. from Orleans to Provincetown, through Eastham, Wellfleet and Truro. It is planned to use the sand and oil type road that was invented by the old Highway Commission on the Cape where a stone road can be built only at excessive cost. The new road will be 18 ft. wide all the way, with broad, easy curves. The work will mean that for the greater part of the summer, travel on the cape will be subject to detours and delays. The approach to the Cape by way of Plymouth will be bettered by reconstruction in Kingston.

Elimination of the steep and rough Leicester Hill has been sought for a long time by all who had occasion to travel by road between Worcester and Springfield. It has never been found possible to put a surface that would hold on this grade and many suggestions have been made for alternative routes. After much study the state engineer finally suggested a route to the south of the hill and that was agreed upon by all parties interested. The road will be of concrete and will take travel around the center of Leicester, which is on top of the hill. This improvement will greatly help motor truck transportation as well as the movement of passenger cars. On the same route there is to be another important improvement by the rebuilding of the road in Cherry Valley, just beyond Worcester. This road will also be of concrete.

Work on the new road around Sherburne Mountain, just west of Greenfield, near the beginning of the Mohawk Trail proper, was started last year and good progress was made. It will be finished this season and will remove the last serious obstacle to complete enjoyment of the state's greatest scenic motoring route. The new road will be to the north of the present route. The hard-surfacing of the Mohawk Trail proper cannot be undertaken this year. In the same neighborhood, work is to be done on the Connecticut Valley route in Bernardston, north of Greenfield, to connect with the Vermont roads.

For several years the state has been reconstructing sections of the Newburyport Turnpike with the idea of bringing it up to the standard of the best state highway and providing a direct good road from Boston to Newburyport by the shortest route, thus relieving the North Shore line. This season the work is to be continued by the completion of the work started last year in Saugus and by the construction of a new section through Lynnfield and Peabody to the Danvers line. The road will be of asphaltic macadam and of the standard width.

State highway construction will be aided this season by the employment of a large number of motor trucks, formerly owned by the War Department, but assigned to Massachusetts in the distribution of war trucks ordered by the Government. The Highway Division of the Department of Public Works has 190 such trucks of 2, 2½, 3 and 5 tons capacity. It is the intention of the department to use these trucks largely in maintenance work, trucks being assigned to the different sections of the state as they are needed. Some will also be used in new construction carried on directly by the Division of Highways. It is not the intention to rent these trucks to contractors. It may be that some will be loaned to small towns.

Highway work will be very expensive because of the high cost of labor, all kinds of materials and of transportation, but the demand of the rapidly growing motor traffic, both passenger cars and trucks, is so great that new roads must be built and the old ones maintained. The work contemplated this year will not only keep the present system in good shape, but will bring about improvements that have been needed for many years.

For the first time in recent years, the City of Boston has penalized contractors for failure to live up to their bids for city work. The contractors are D. M. Biggs & Co., the lowest bidders for furnishing bank gravel and sand in eight city districts. After the bids were opened, the company wrote to the purchasing agent of the city, George J. Cronin, that it would be unable to furnish the material in three of the districts, but requested that it be awarded the contract for the other five districts.

Mr. Cronin announced that he intended to penalize the company for this action by retaining the $500 check which the company submitted with its bids. In the three districts in which D. M. Biggs & Co. said they were unable to furnish the material, Mr. Cronin awarded the contracts to the next lowest bidder.

Arlington faces a record tax rate of $32.13 the coming year, if the recommendations of the finance committee are sustained. The committe has made many cuts in the original estimates of the different departments, and an even higher rate will result if the budget, as prepared by the finance board, is not voted. The total town grant amounts to $899,410.20, this being the largest in the history of the town. A record appropriation of $341,800 is needed for the schools, the increase being due largely to increases in the salaries of the teachers. An appropriation of $24,000 will be sought to cover the cost of the removal of snow.

Mayor Gainer, of Providence, R. I., has served notice on the Municipal Employees Union that its demands for a 25% per increase, an 8-hour day and other changes would not be granted.

The Massachusetts House of Representatives has passed to be engrossed the bill for the completion of highways in the five western counties, which carries with it an appropriation of $1,000,000.

It has now been decided to abandon the construction of the proposed Old Colony Boulevard connecting Boston with Massachusetts points to the south.

More than $1,000,000 has been appropriated for this project and some $425,000 has been expended.

Unless there is a material change in the present situation, this broad thoroughfare, which was to link up the city proper, by way of South Boston, with Neponset and by means of a new bridge over the Neponset River, with Quincy and the system of state road along the South Shore and leading to the Cape and other points in southeastern Massachusetts, cannot be finished. It has been blocked by the inability of the Metropolitan District Commission, successor to the old Metropolitan Park Commission, which has long been at work on the boulevard, to secure permission from the State Department of Public Works, which includes the old Waterway Commission, to make a short fill in tidewater and build a culvert at Fox Point, Savin Hill.

The question of filling in a few hundred feet at Fox Point, to provide a location for the boulevard, and also constructing a culvert or small bridge over a creek in Patten's Cover, between the Calf Pasture and Savin Hill, came up recently at a hearing before the Commissioner of Public Works, and permission was refused. The Metropolitan District Commission feels that there is no other route than the one selected for the boulevard, on account of the great cost for land and for other reasons, and, therefore, has abandoned the project.

All the land required for the boulevard has been secured at a cost of $400,000, which will be practically wasted now that the boulevard has been abandoned. Of the remaining $75,000 about $25,000 has been expended in filling in to subgrade a part of the route. About one-half of the proposed boulevard has been filled to subgrade, including a stretch from Columbia Road toward Fox Point and another section in Neponset. A considerable part of the remainder would be included in the bridge across Dorchester Bay. This bridge, as planned, would have a draw so as not to interfere with navigation.

The stretches that have been filled to subgrade are of no local value unless they are connected. The work that has been done at the Calf Pasture, if finished would lead nowhere without the continuation to Fox Point and beyond, and the subgrading in Neponset, which involved the removal of several houses, would, if completed, supply a road of no importance to the Neponset district.

The only part of the Old Colony Boulevard project that has not been given up is the construction of the new bridge at Neponset. This bridge is absolutely necessary to take care of general traffic, and the Metropolitan District Commission proposes to construct it and has recently called for bids, which were opened on April 28.

The state has appropriated $620,000 for this bridge independently of the $475,000 voted for Old Colony Avenue, making the entire undertaking of boulevard and bridge more than a $1,000,000 project. The old bridge, after being for a long time considered unsafe and wholly inadequate for the traffic has been removed, and at present a temporary bridge is being used.

What action, if any, will be taken in regard to Old Colony Boulevard has not become apparent. As it now stands the project is impossible because of the objection of the state board that controls the waterways.

Appropriations amounting to approximately $2,785,000 for improvements within the metropolitan district are recommended by the committee on metropolitan affairs in a bill reported to the House.

Under the bill, the Metropolitan District Commission would be allowed to expend $250,000 for a pumping station at Spot Pond, $200,000 for Chestnut Hill Reservoir, $175,000 for replacing the Arlington standpipe, $260,000 for increasing the capacity of the northern pipe line, $1,800,000 for a direct gravity line to connect the western aqueduct with Spot Pond.

The committee reported against the bill for a parkway from Commercial Point to Squantum.

Melrose has raised the pay of city laborers 25 ct. per day making the rate $4.50.

Quincy has raised the pay of the laborers in the Street, Water and Sewer Departments to $5.00 per day, an advance of $1.00 over the old rate.

Effect of Car Tracks Upon Traffic Capacity of Roadways

(Concluded from page 266)

the tracks adjacent to the curb. The situation as a whole, however, well illustrates the bearing of both kinds of traffic upon the subject under consideration.

In another, but perhaps indirect, way can be shown somewhat how traffic is diverted on street car streets, and that is, by its effect upon the pavements.

In the Borough of Brooklyn careful records have been kept of the cost of repairs to all pavements for more than 15 years, by individual streets.

The cost of repairs to asphalt pavements on streets without car tracks for the years 1914 to 1918, inclusive, has averaged 2 ct. per square yard and for streets with car tracks the cost has been 3.4 ct. While these figures prove nothing directly, they are at least indicative, as they give results upon 31,645,000 and 3,884,000 sq. yd. of pavement on streets without and with car tracks, respectively.

The problem of track location on roads is somewhat different from that on streets, as the local conditions are so different. Then too, a country road, even if paved, seldom has its pavement of greater width than will accomodate expected vehicular traffic, so that any interference with existing pavement will be serious. Fortunately, however, there are generally no very serious objections to the side location, the tracks being sufficiently far apart to provide for ample width of the pavement between them. The new National Highway bill proposes where feasible, a 66-ft. width of right of way and a pavement width of not less than 20 ft. This would give ample room for car tracks on both sides of the pavement. Whenever a wider roadway is required or any special local conditions arise, each case must be considered on its individual merits.

If the tracks are located in the pavement, whether in a city street or country road, the shape of rail and method of construction become very important. As has been previously stated, the mere existence of tracks in a pavement should not interfere with traffic. As a matter of fact, they do. The writer some 25 years ago saw a track on 14th St., Borough of Manhattan, laid with two center bearing rails, instead of one, laid on longitudinal wooden stringers, the rails and tracks being so near and of such construction that traffic in the center of the street was almost entirely cut off. Fortunately such conditions do not now exist anywhere, but they illustrate the importance of the principle.

No doubt the well known T-rail of the steam roads is the most economical type of rail for traffic. It does not, however, permit a smooth junction between the pavement and the rail, either between the tracks or outside. This type of rail also is likely to cause ruts alongside the rail if the tracks are much used by vehicles. With the present grooved rail in use in most cities, with a practically square edge on the outside and the flat lip on the inside, it is perfectly practicable to construct a track that will not interfere with traffic, especially if a 60-ft. rail be used. Specially burned brick or specially cut stone blocks are sometimes used in connection with the T-rail, the groove being really cut out of the blocks. This method often produces good results. On a country road where the tracks are laid outside of the pavement the T-rail can, of course, be used to advantage.

But whatever the type of construction, it should be designed with the idea of keeping both the track and pavement in good condition. Unfortunately, the track areas of pavements in American city streets are not generally in good condition. Much improvement, however, has taken place during the past twenty years and most street railway companies realize that it is good policy to keep their plant well maintained. Again, unfortunately, soon after this realization, the world war came on, bringing with it financial changes to all, but which seemed to injure street car companies more than almost any corporations, bound as the most of them are by franchise obligations as to permissible fares, with costs of labor and materials mounting up with aeroplane-like rapidity.

If then, car tracks are to exist in paved streets or roadways, they should be so constructed as to present as little interference as possible with the pavement.

Perhaps the most important item in construction is the type of rail to be used and this has previously been discussed.

The roadbed and foundation too, must be specially prepared. The rail must not give appreciably under car traffic, as it is almost impossible to maintain any pavement against a rail that moves vertically under the passage of cars.

The joints too, are a prolific source of trouble. Many times a hole in a pavement along the track has its origin at a defective joint. The use in the past few years of a 60-ft. rail has helped this situation very much. Admitting the force of the arguments used herein, it follows that street car tracks do obstruct traffic very maerially when in use in streets or roadways.

Also that the extent of this obstruction depends upon the amount of existing traffic and location of tracks, being greatest where both tracks and roadway are used to their utmost capacity and the tracks laid in the pavement, and almost nil where traffic is light and the tracks located outside of the pavement proper. Probably no better illustration of the relative traffic capacity of street car and non-street car streets can be given than existing conditions on Jackson Boulevard and either Adams or Madison Streets in the loop district of Chicago in the rush hours.

In designing then, a street or road where provision must be made for street car lines, a study must be made of both street car and vehicular traffic, present and prospective, so that the relative importance of each may be determined. As a general proposition, the center of a paved street will be the correct location, but often special conditions may make a different one desirable. In the same way it might be said that on a country road the side location would be most logical, changing somewhat possibly when passing through small towns or villages.

Wherever the location, the type of construction should be good, variations being permitted according to exact location and character and amount of traffic.

As careful provision should be made for the maintenance of the tracks and pavement to be kept in repair by the street car company, if any, as for the roadway pavement itself. The writer knows that this is often difficult, but thinks that unless the company is operating under a franchise giving it special privileges, good results can be obtained by some arrangement. If a new franchise is to be issued, the car company might be obligated to pay a specified amount, with the understanding that the highway authorities would keep the pavement in repair. The maintenance of the tracks and roadbed must be left to the operating company.

The writer feels, therefore, that if these precautions are taken, while some traffic obstruction must exist, it will in this way be reduced to a minimum and the general traveling public benefited as much as possible.

MEETINGS

Calendar of Coming Meetings

June 1-3.—Canadian Good Roads Association.— Seventh Annual Convention, Winnipeg, Manitoba, Canada. Secretary-treasurer, Geo. A. McNamee, 909 Birks Bldg., Montreal, Que.

June 16-18.—North Carolina Good Roads Association—Annual Convention, Asheville, N. C. Acting Secretary, Miss H. M. Berry, Chapel Hill, N. C.

National Highway Traffic Association

The annual meeting of the National Highway Traffic Association was held at the Automobile Club of America, New York, N. Y., at 8:00 p. m., May 13, 1920. Prior to the meeting an informal dinner was served in the grill room and about 50 members and guests were present. A larger attendance had been expected but meetings of other associations with allied interests were held on the same date and so reduced considerably the number present at this meeting.

Following the dinner, the annual reports of the officers were read, the report of the nominating committee presented and officers for the ensuing year elected.

The papers presented were brief but interesting, and stimulated considerable discussion. Nelson P. Lewis, Chief Engineer of the Board of Estimate and Apportionment of New York City, spoke on "The Effect of the Motor Vehicle upon the Planning of Streets." T. A. Aspell, Manager, Truck Tire Sales Department, Goodrich Rubber Co., Akron, O., spoke on the "Realtion of Solid and Pneumatic Tires to Efficient Highway Transport." H. Eltinge Breed, Consulting Highway Engineer, New York City, spoke on the "Relation of Tractor and Trailer to Highway Design."

Following the presentation of papers, discussion ensued on various problems in highway transport, chief of which was the regulation of weight of motor trucks. It appeared to be the general feeling that motor trucks did the greatest damage to the roads in the spring and the fall when the frost was leaving or entering the ground and that it would be wise to limit the use of heavy trucks during this season.

Arthur H. Blanchard, Professor of Highway Engineering and Highway Transport at the University of Michigan, was elected President; David Beecroft, Vice President, North Atlantic Division; R. C. Hargreaves, Vice President, North Central Division; Elmer Thompson, Secretary; and George H. Pride, Treasurer.

The directors for the following states were elected: Connecticut, S. W. Taylor, President, "Rider and Driver;" Delaware, Gen. Coleman du Pont, Vice Chairman, Federal Highway Council; District of Columbia, Wm. P. Eno, traffic expert; Illinois, Wm. T. Beatty, President, Austin Manufacturing Co.; Indiana, Tom Synder, Secretary, Indiana Transfer and Warehouse Association; Massachusetts, Charles Henry Davis, President, National Highways Association; Michigan, Roy D. Chapin, President, Hudson Motor Car Co.; Missouri, F. W. A. Vesper, President, Vesper Buick Auto Co.; Nebraska, George W. Wolz, President, Nebraska Good Roads Association; New Jersey, Col. Jefferson de Mont Thompson; North Carolina, R. J. Corbitt, President, Corbitt Motor Truck Co.; Ohio, F. A. Sieberling, President, Goodyear Tire and Rubber Co.; Wisconsin, Phillip A. Koehring, Secretary-Treasurer, Koehring Machine Co.

Canadian Good Roads Association

The seventh annual convention of the Canadian Good Roads Association will be in the Royal Alexandria Hotel, Winnipeg, Manitoba, June 1, 2 and 3, 1920. The sessions will be held in the Banquet Room and the seventh good roads exhibition will be held in the old ball room, where road materials, models and photographs, etc., will be exhibited.

The executive officers of the association are as follows: Honorary President, A. W. Campbell, Commissioner of Highways, Dominion Government, Ottawa, Ont.; President, S. L. Squire, Honorary President, Ontario Good Roads Association, Toronto, Ont.; First Vice President, Andrew F. Macallum, Commissioner of Works, Ottawa, Ont., Second Vice President, Dr. E. M. Desaulniers, Montreal, P. Q.; Secretary-Treasurer, Geo. A. McNamee, 909 New Birks Bldg., Montreal, P. Q.

The program is as follows:

Tuesday, June 1, 9.00 a. m.

Registration of members and delegates at convenheadquarters.

Appointment of nominating and resolutions committee.

Congress called to order by the President.

Adresses by Government and highway officials.

Particulars of the demonstration of road work by the Canada Ingot Iron Co., Kelly-Powell, Ltd., and the United Grain Growers, Ltd., will be announced.

Tuesday, June 1, 2.30 p. m.

Presiding officer—S. L. Squire.

"Federal Aid," by C. A. Magrath, Chairman, Highways Commission, Dominion Government, Ottawa, and E. O. Hathaway, District Engineer, U. S. Bureau of Public Roads, Minneapolis, Minn.

"Gravel Roads," by B. M. Hill, Provincial Highway Engineer, Province of New Brunswick. Discussion.

"Surface and Subsoil Drainage," by A. Fraser, Highways Department, Province of Quebec. Discussion.

"Road Machinery," by Arthur H. Blanchard, Professor in charge of Highway Engineering and Highway Transport at the University of Michigan, Ann Arbor, Mich. Discussion.

Tuesday, June 1, 7.30 p. m.

Annual dinner and entertainment (informal), Royal Alexandria Hotel.

Wednesday, June 2, 10.00 a. m.

Presiding officer, T. P. Regan.

"Roads as an Aid to Agriculture."

"Economical Methods of Transporting Road Materials," by A. P. Sandles, Secretary, National Crushed Stone Association, Columbus, O. Discussion.

"How to Improve and Maintain Earth, Clay and Sand Roads," by A. R. Hirst, State Highway Engineer, Wisconsin. Discussion.

"Broken Stone Roads," by Geo. Hogarth, Chief Engineer, Ontario Highways Department. Discussion.

Annual meeting, Canadian Automobile Association, will be held at noon at the Royal Alexandria Hotel.

Wednesday, June 2, 2.30 p. m.

Presiding officer, Russel T. Kelly.

"Suggestions for Financing a Provincial Highway System," by A. W. Campbell, Commissioner of Highways, Dominion Government, Ottawa.

"Bituminous Treatment of Sand Roads," by Col. W. D. Sohier, Ex-chairman, Massachusetts State Highway Commission. Discussion.

"Road Dragging and Maintenance Competition," Discussion.

"Organization of Provincial Highways Departments to Obtain and Maintain High Standards of Efficiency," by A. E. Foreman, Chief Engineer, Public Works Department, Province of British Columbia. Discussion.

Wednesday, June 2, 8.30 p. m.

Annual general meeting of the Canadian Good Roads Association. Election of directors and officers and reports of officers of association.

Thursday, June 3, 10. a. m.

Presiding officer, Hon. S. J. Latta.

"Schools for Highway Engineering," by Gen. C. A. Mitchell, Dean, School of Science, University of Toronto.

"Highway Bridges and Culverts," by M. A. Lyons, Chief Engineer, Good Roads Board, Province of Manitoba. Discussion.

"Asphaltic Concrete Pavements," by W. H. Connell, Consulting Engineer, Philadelphia, Pa. Discussion.

"Cement Concrete Roads," by W. P. Near, City Engineer, St. Catharines, Ont. Discussion.

At noon there will be a luncheon and drive.

Thursday, June 3, 2.30 p. m.

Presiding officer, A. McGillivray.

"The Value of the Local Association in a Nationwide Highways Movement," by W. Findlay, Business Manager, "The Globe," Toronto, Ont.

"The Importance of Keeping a Traffic Census," by W. A. McLean, Deputy Minister of Highways, Province of Ontario. Discussion.

"Refined Tar in Construction and Maintenance," by Andrew F. Macallum, Commissioner of Works, City of Ottawa. Discussion.

"Road Oils and Carpet Coats," by J. A. Duchastel de Montrouge, City Manager, Outremont, Que. Discussion.

A special conference of local and provincial good roads associations will be held on Thursday afternoon, June 3, at 4 o'clock, in the committee room, under the chairmanship of Wm. Findlay.

PERSONAL MENTION

V. W. Samms has resigned as city engineer of Pocatello, Idaho.

L. C. Read has been appointed city engineer of Sandusky, Mich.

Myron E. Downie has resigned as county engineer of Dubuque County, Iowa.

Oswald Lind has resigned as county engineer of Wilkin County, Minnesota.

E. C. Wood has resigned as deputy engineer of Spokane County, Washington.

James R. McCamman has been appointed county surveyor of Eaton County, Michigan.

H. E. Palmer has succeeded Oswald Lind as county engineer of Wilkin County, Minnesota.

John H. Hacker has resigned as county road superintendent of Huntington Count, Indiana.

Carl Wyant has resigned as deputy engineer of Santa Barbara, Cal., to enter private practice.

John Irwin has resigned as city engineer of Mt. Clemens, Mich. and has entered private practice.

Carl Widener has resigned as city engineer of Bozeman, Mont., but will devote a part of his time to work on city improvements.

J. W. Johnston has been appointed district engineer in charge of the Milwaukee office of the Portland Cement Association. Before joining the forces of this association in 1916, Mr. Johnston was city engineer of Sioux Falls, S. D.

GOOD ROADS
CONSTRUCTION TRANSPORTATION MAINTENANCE

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*Illustrated article

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CONSTRUCTION TRANSPORTATION MAINTENANCE

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THE HIGHWAY CONTRACTOR AND ROAD BUILDER

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JAMESTOWN, N. Y., JUNE 2, 1920

Number
22

Plant Used on a Delaware Road Job

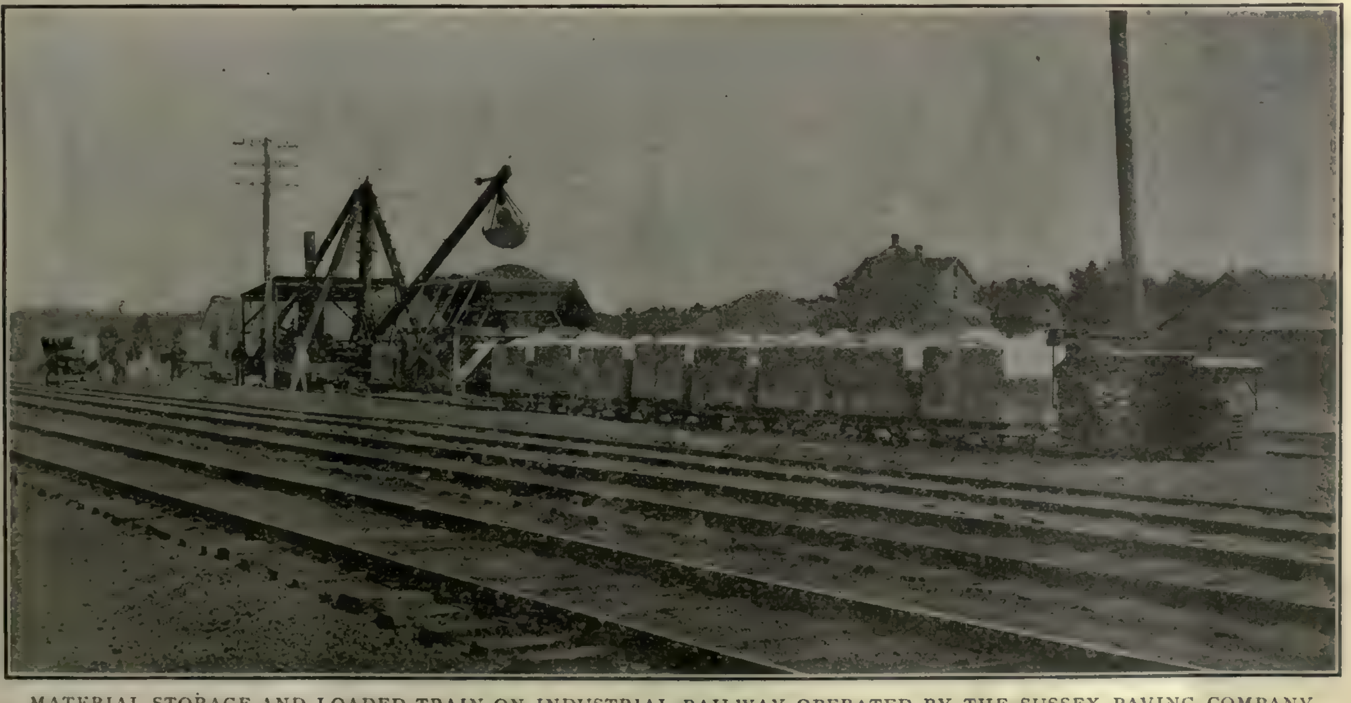
Methods of Handling Imported Materials in Construction of a Cement Concrete Pavement on the Laurel-Delmar Road

A concrete road, about 7 mi. in length, was recently constructed by the Sussex Paving Co. between Laurel and Delmar in the southern part of Delaware. The road was built 16 ft. wide, with 6-in. sides and a depth of 8 in. in the center.

All materials used in the construction were imported, the stone coming from Pennsylvania and the sand from the eastern shore of Maryland. The stone cost $3.40 per short ton and the sand $2.00 per short ton. In unloading the materials a traveling railroad derrick was put into service. This derrick was equipped with a ¾-yd. clamshell bucket which transferred the materials from the railroad cars to bins and storage piles having a storage capacity of 3,500 tons of stone nd 2,000 tons of sand. These quantities were on hand before the laying of the concrete was started. In addition to the storage of stone and sand, 10 cars of cement and 1 car of lime were in storage.

The method of unloading material was unique. Instead of the customary storage bins, which are costly both to erect and dismantle, hopper bins, as shown in the accompanying illustration, were built to run on the derrick track. The track of the industrial railway which transported the materials from the loading station to the mixer was placed under these hoppers. Material coming in while concrete was being laid was unloaded directly into the hoppe bins. This method worked out effectively and did away with the considerable expense of erecting storage bins.

A Koppel industrial railway was used in carrying



MATERIAL STORAGE AND LOADED TRAIN ON INDUSTRIAL RAILWAY OPERATED BY THE SUSSEX PAVING COMPANY ON THE LAUREL-DELMAR ROAD the aggregates from the loading station to the mixer. Three Plymouth gasoline locomotives were used on 20-lb., 24-in. gauge track, having 6 ties to a section. Each train consisted of 8 to 10 cars, each car carrying 2 batch boxes. The cars were of the square frame type and the batch boxes were of the wooden drop bottom type, the doors being held by a chain passing through the center of the box over a roller at the top edge and connected with a toggle lever fastened to the outside of the box. This lever locks automatically, and when it is released the doors open.

The batches consisted of 16 cu. ft. of stone, 8 cu. ft. of sand, which were delivered from the loading hopper, and 4 bags of cement and .6 cu. ft. of lime, which were taken on at the cement storage siding. The cement was left in the bags on top of the stone and sand in the batch boxes and the bags were opened at the mixer. One locomotive was kept employed at the loading station and two locomotives hauled to and from the mixer.

The mixing of the concrete was done by a Foote 27-E mixer of 28 cu. ft. dry mix capacity. It was equipped with a derrick to lift and dump the batch boxes directly into the mixer. The time occupied in lifting and dumping one box averaged 9 seconds.

Because of the fact that considerable rainy weather was encountered, operations were retarded somewhat. However, the average amount of concrete laid per day for the first week was 121 cu. yd.; for the second week, 122 cu. yd.; for the third week, 127 cu. yd.; for the fourth week, 124 cu. yd.

The average haul per day was 218.5 tons an average distance of 1.5 mi. The maximum haul was 21,000 ft. The unloading station was located about 2,000 ft. from the road and about in the center of the 7-mi. stretch.

The actual hauling cost per ton-mile for labor, gasoline, oil and track maintenance, was 9.5 ct.

Highway Work in Minnesota

The county officials of Minnesota have been requested by the state commissioner of highways to contract for no new highway construction during this season except that which is necessary to complete work already undertaken. Since the approval of the Minnesota State Highway Department is necessary before the counties can secure federal or state aid, it would appear that Minnesota will devote herself to the completion of highway work now contracted for.

Railroad Derrick Damages Highway Bridge

The heavy supporting booms of a Rock Island steam derrick struck two skeleton girders of the Muscatine, Ia., highway bridge on April 14 and damaged the bridge to such an extent that it was closed to traffic. The derrick was part of a work train which was passing under the bridge and the heavy "A" frame, made of 12-in. beams, protruded about 30 ft. in the air, striking the girders squarely. A 20-ft. section of the bridge flooring was left in a weakened condition.

MIXING PLANT AND INDUSTRIAL EQUIPMENT USED TO HAUL MATERIAL ON A CEMENT CONCRETE PAVING JOB ON THE LAUREL-DELMAR ROAD IN DELAWARE

Taking an Interest in Motor Truck Legislation*

By HARRY MEIXEL, Jr.†

Time and again laws unduly restricting the size and weight of motor vehicles, imposing enormous registration fees upon them, or in other ways retarding their logical development as a modern, efficient and economic medium of transportation, have been placed on the statute books of our states before many of those interested in the production, distribution and use of these vehicles have been even aware that bills providing for such measures had been introduced in the state legislatures.

How is this general ignorance about the preparation, introduction and passage of such harmful legislation to be prevented? How is such harmful legislation to be removed and kept from the statute books? How are laws, which will prove beneficial and just to the motor vehicle, to be substituted for such harmful legislation?

The Cornerstones for Proper Motor Vehicle Legislation

The answer to these questions is three-fold.

First: Those concerned and interested in the motor vehicle, after giving thorough investigation and consideration to all the factors involved and with due regard for the public interest, must work out and set forth scientific and equitable principles which should be at the base of all laws dealing with the motor vehicle.

Second: These scientific and equitable principles must then be placed before the people of the 48 states of this union in such a way that the public will see the need of and demand the adoption and application of uniform motor vehicle laws in conformity with them.

Third: After these scientific and equitable principles have been established as the sound and just foundations for the motor vehicle laws of the United States, every effort must be made to preserve them from unwarranted disturbance, and to modify, add to or expand them intelligently as conditions require.

The Organization and Functions of the Motor Vehicle Conference Committee

It is with these ends in view that the American Automobile Association, Motor and Accessory Manufacturers Association, National Automobile Chamber of Commerce, National Automobile Dealers' Association, Rubber Association of America and the Trailer Manufacturers Association of America have cooperated in the formation of a so-called Motor Vehicle Conference Committee. In the language of the resolution formally constituting the committee:

"It shall be the duty of the Motor Vehicle Conference Committee to compile in their latest form all federal, state, county and municipal laws or ordinances dealing with the several interests and activities of its component organizations; gather information regarding projected legislation of such character, and endeavor by all legitimate means to retain existing, and secure additional good laws, and bring about the repeal of those which are harmful or unfair to the proper welfare of the members of the Motor Vehicle Conference Committee. It shall also perform such other services for its constituent members as it may from time to time by resolution determine upon."

Work Already Undertaken by the Committee

The committee in order to carry out these purposes, has already begun to compile all state laws which directly or indirectly affect the motor vehicle and its use. On the completion of this compilation the laws will be digested and rearranged in accordance with a uniform scheme of subject-matter, and any changes or additions promptly recorded in the proper places. When it is realized that one state will not permit vehicles wider than 90 in. to operate on its highways, that another state forbids those wider than 84 in., while still other states permit any widths whatever, but are likely to pass laws, at any time, more radical even that those of their neighbors, it is obvious that the men who manufacture and the men who purchase motor vehicles are vitally interested in knowing quickly and accurately what the law regarding widths is or is likely to be in any state.

While the committee is acquiring complete knowledge about existing laws, it will also amass facts and figures and develop the scientific and equitable principles upon which, as has been said, motor vehicle laws should be premised. Where they are in accord with these principles the committee will urge their retention; where they run counter to or fall short of these principles the committee will seek their repeal or amendment and the adoption of the uniform legislation which it will prepare.

These objects which have been discussed, important as they are, can, and indeed from their very nature, must, be achieved over a period of years. On the other hand, there is a piece of work that can and must be done now.

Work Which Must Be and Is Being Done Now

During the course of this present year regular sessions of the legislatures will be held in the States of Georgia, Kentucky, Louisiana, Maryland, Massachusetts, Mississippi, New Jersey, New York, Rhode Island, South Carolina and Virginia. Rumor has it that the motor vehicle is going to come in for a lot of attention from the lawmakers of some of these states, and drastic regulations and exorbitant license fees are predicted. To be sure, there is a big distance between a rumor of legislation, or indeed between the introduction of a bill, and its final enactment into law; but there are several circumstances which give color to these predictions. The imperative need for more revenue for conducting the governmental functions of state, county and municipal governments; the outlays of public money for highways; the stress and strain to which motor vehicle competition subjects other forms of transportation, all conspire to make the motor vehicle a target for legislation and still more legislation.

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*Paper presented at the annual convention of the National Highway Traffic Association and the Highway Transport Conference of the National Automobile Chamber of Commerce, Chicago, Ill., Jan. 29, 1920.

†Secretary, Motor Vehicle Conference Committee, New York, N. Y.

The Motor Vehicle Conference Committee has prepared a comprehensive list of subjects which such legislation might possibly deal with; has arranged to secure immediate information about the introduction into the state legislatures of any bills dealing with these subjects and the action taken upon them; has secured a secretarial staff to analize and report on this information; has established a central office at 7 E. 42nd St., New York City, where it will meet to consider and take action upon the information supplied it; and has made every other possible effort to build up a mechanism whereby it can secure and disseminate prompt and correct legislative information to its constituents. Nor will the committee stop here. In all cases where the member organizations can move forward as a unit in harmony for the passage or defeat of a measure they will do so and will use every proper means to present a clean case in an effective manner before the public and its lawmakers. Where united action seems impracticable or undesirable each organization will be free to take such steps as it feels its interests will require.

Cooperation with Committee Vital

It is unnecessary to point out or dwell at length upon the possibilities which the Motor Vehicle Conference Committee possesses for enormous service to the individual members of the organizations represented by it, and yet the extent of that service will be directly proportional to the cooperation it receives from those same individual member on the immediate scene of action who must help to bring about the adoption of fair laws. A legislator is usually an intelligent and capable human being, whose one aim is to deal justly with all his constituents. He is being called upon, however, in the brief space of a few months to pass judgment upon hundreds of measures covering scores of different subjects, and it is not to be wondered at that he sometimes makes mistakes which result in hardship to various groups of people. He, therefore, welcomes a plain, pithy statement of facts upon which to base his vote and defend it, and beyond a doubt if those interested in the motor vehicle and its future furnish him with these facts he will be the first to see to it that the motor vehicle gets a square deal under the law.

State of Pennsylvania Frees 16.6 Miles of Highway

The Pennsylvania State Highway Department has purchased 16.6 mi. of turnpikes, jointly with the several counties, and converted them into free highways.

The Lewisville and Prospect Turnpike, 1.6 mi. long in Prospect County, was purchased for $4,800, the county and the state each paying half of the cost.

The Springhouse and Hilton Turnpike, 10 mi. long, was purchased for $80,000. Montgomery County paid $34,600, Bucks County $5,400 and the balance was borne by the state.

The Lancaster and New Danville Turnpike, 5 mi. on state route 332, was freed at a cost of $30,000, which was borne equally by the state and the county.

Prizes for Essays Awarded at Good Roads Meeting in New York

More than 5,000 high school students attended the meeting held on May 15 in the Capitol Theater, New York City, in connection with the Ship-by-Truck week observed throughout the country. Two prizes of $50 Liberty bonds were awarded for the best essays of 500 words written by high school students. State Highway Commissioner Greene awarded the prizes. Addresses were made by Secretary of State Hugo, William L. Ettinger, Superintendent of Schools, New York City, and Grover A. Whalen, Commissioner of Plant and Structures, New York City. Motion pictures were shown which depicted the usefulness of motor trucks in transporting food and other products of the land from the farms to the cities.

New Jersey Highway Commissioner Says Roads Taken Over Must Be Rebuilt

At the annual convention of the Manufacturer's Association in Atlantic City, N. J., John W. Herbert, Chairman of the New Jersey State Highway Commission, declared that a large percentage of the New Jersey state highway system built under county supervision four or five years ago had disintgrated and must be rebuilt. Much of the mileage taken over by the state, said Mr. Herbert, is beyond economical maintenance and must be rebuilt with better material.

The completion of a cross-state highway would furnish the backbone for roads penetrating the great commercial and industrial districts, it was also pointed out, and a vehicular tunnel between New York and Jersey City and a bridge between Camden and Phiadelphia would tie up the commercial interests of New Jersey with those of her neighbors.

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CONSTRUCTION TRANSPORTATION MAINTENANCE

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Copy for classified and other advertisements where proofs are not required will be accepted until noon on Monday of the week of issue.

Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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HANDLING MOTOR TRUCK FLEETS

A new field that has almost unlimited opportunities for men of engineering ability is opened by the adoption of the motor truck for general hauling purposes. Some idea of the work to be done in this line of activity may be obtained by reference to the article entitled, "Dispatching and Routing of Motor Trucks," printed elsewhere in this issue.

Motor trucking is a remarkable efficient and economical transportation facility under certain conditions, and one of these conditions is proper operation. This is especially important where fleets of machines are utilized, either in city delivery or in intercity hauling, and the handling of such fleets is not by any means a simple job.

The executive in charge of the trucks of a business using them for its own deliveries or of an independent highway transportation enterprise must possess broad and varied qualifications. He must know trucks and he must know roads and road conditions. He must know a good deal about the business or businesses his trucks serve. These are only a few of the things he must know.

Transportation engineering, as it is usually called, promises to be one of the important branches of engineering in the near future.

WHAT THE ROAD BUILDER FACES

The events of the past few years have been full of significance to the road builder.

Within twenty years the automobile has developed from a not altogether practical plaything for the few to a commonplace vehicle for the many.

Within a decade the motor truck has developed from a novel vehicle for urban hauling to a powerful factor in the nation's transportation system.

And within the past five years the railroads of the country, under the blight of Government control and operation, have been all but wrecked, their failure in the emergency of war being by far the greatest factor in the remarkable growth of motor truck transportation.

Inevitably, these things have set up a demand for good roads—roads connecting farms with market towns, and cities with resorts; roads between large centers of population and between widely separated rural communities; roads for commercial hauling and roads for pleasure driving. The demand has come from all sorts and conditions, from the cities and from the country, from industrial centers and agricultural communities, from business interests and from tourists.

And the demand has been insistent and sustained. It has had to be met, and upon the road builders has fallen the burden of meeting it. They have been obliged to not only solve the technical problems of construction and maintenance, but also those of planning and financing. And at different periods different phases of the work have been the most trying.

At first the raising of money presented the greatest difficulties. The demand for good roads was a demand from a class and other classes opposed it. Later the benefits of better roads to all classes came to be realized and the obtaining of funds was the easiest part of the job. By that time the motor-driven vehicle had so largely replaced the horse-drawn vehicle that the technic of construction and maintenance had to be modified. Road builders do not yet know all there is to know about building roads, but the technical problems have become of comparatively little moment and road builders are facing another problem that bids fair to overshadow the others. At present it is not a question of where to get the funds or of what methods and materials to use, but of where to get the materials and the labor.

The situation is serious, but it is by no means hopeless. The business of road building is confronted with the same perplexing questions that are confronting other businesses, and road buiders, like the men carrying on other business, must find a way. The roads are needed as they never were needed before and the industrial and commercial progress of the country depends upon their construction. The times are unusual and unusual measures must be adopted. There must be careful study, intelligent planning, hard work and thorough cooperation. With these a way will be found.

West Virginia Good Roads Association Produces Educational Film

Bearing the Title "Road Ahead for West Virginia," Two Film Reel Shows Relation Of Good Roads to Progress of Community

An educational motion picture film for the promotion of highway improvement in West Virginia has been produced by the West Virginia Good Roads Association and is being sent to all sections of the state for exhibition. The film is in two reels and bears the title, "The Road Ahead for West Virginia."

The film shows scenes representing various periods in the history of West Virginia, depicting the various modes of transportation and emphasizing the importance and necessity of good roads. The picture, it is reported, is effective from the educational standpoint, and rouses interest in better roads wherever exhibited.

Asphalt Roads in New Jersey

New Jersey is known as the "Garden State of the East," and indeed her counties are prolific in their supply of foodstuffs for the great cities in the eastern part of the country. New York City and Philadelphia receive abundant quantities of fruit and vegetables from the fertile soil of Jersey, and with what regard the Metropolis holds her supply of food coming from her neighbor state may be gained from the anxiety which exists in the city when the ferries and other means of transportation are tied up and it is impossible to get the eatables furnished by New Jersey.

Burlington County in New Jersey is one of the largest and most productive agricultural areas in the state—one might say in the East. Various kinds of fruits and vegetables are grown there, and consequently the means for transportation of the vast quantities of the county's foodstuffs has long been one of the paramount problems of the residents. After finding that the railroads are insufficient to accomodate rapidly and conveniently the growing demand for its food products, the country has begun an extensive road building program.

Last season more than 10 mi. of sheet asphalt were laid in Burlington County, and during the coming season 20 mi. of that type will be constructed. James Logan, County Engineer, is in direct charge of the work, which is being let to contractors in the usual manner.

One of the features of the work in Burlington County is the fact that the farming population is virtually unanimous in its desire for modern, high class roads. The value and efficacy of durable highways has been proved to the farmers, one instance being a stretch of sheet asphalt which extends from Mount Holly easterly towards Trenton, the capital. This road was built in 1917 on an old macadam base, and has withstood without any maintenance all the banging, weighty traffic going to Trenton and other cities.

Roads in District of Columbia Reported To Be in Bad Condition

"The main roads leading into Maryland and Virginia in the District of Columbia could not be in a worse condition," said A. G. Seiler, Touring Manager of the American Automobile Association, in discussing the need of road improvements in the District. "If repair work on these roads is not started in the near future the District will be compelled to entirely rebuild them at a great expense.

"The District committees in Congress are now at work formulating plans for a change in assessment of the automobile license fees to 50 ct. per horse power. The use of funds collected in this manner will go toward the maintenance of the suburban roads. This legislation, if enacted, would provide for highways in the District which would compare favorably with the high standard set by many of our northeastern states."

Montana Fixes Rental Rates on War Trucks and Tractors

Contractors Are Required to Deposit $1,000 for Trucks and $1,500 for Tractors and pay Monthly Rental of $200 for Trucks and $300 for Tractors to Use in Work on State Roads

A schedule of equipment rentals has been put in force by the Montana State Highway Department.

Only such equipment as is not otherwise requisitioned by counties, cities and towns is rented to contractors and such equipment as may be rented to contractors is rented in accordance with the following provisions:

For each truck, regardless of equipment, there will be required a deposit of $1,000; for a 120 h. p. caterpillar tractor, $1,500. For other equipment a deposit of approximately 20% of value will be required.

The rental rate to contractors for the use of each truck is $200 per month. The 120 h. p. caterpillar tractors rent for $300 per month and other equipment at rates calculated on the basis of annual depreciation.

Equipment is not rented to a contractor until a contract has been awarded to him and surplus war equipment may be used only on state work.

Upon the completion of a contract surplus war equipment must be delivered to Deer Lodge at the contractor's expense or held subject to the orders of the Highway Commission.

TNT is offered to contractors at the rate of 15 ct. per pound.

Unit Street Cleaning Costs in Cincinnati

The following comparative unit costs of street cleaning functions in Cincinnati for the years 1916 to 1919, inclusive, have been prepared by the Cincinnati Department of Street Cleaning, Sewer and Catch-basin Cleaning and appear in the annual report of the department for 1919.

	1916	1917	1918	1919
Flushing, squares	$.119	$.121	$.120	$.131
Street sweepings, cu. yd	.270	.286	.332	.365
Ash collection, cu. yd.	.282	.299	.344	.375
White wings, 1,000 sq. yd.	.305	.301	.313	.328
Broom gang, squares	.243	.238	.264	.241
Gutters, squares	.136	.144	.138	.178
Gutters, after flushing, squares	.136	.140	.167	.169

New York Passes Engineers' Licensing Law

Act Will Become Effective in Two Years And Provides for a License Fee of $25

The bill providing for the licensing of engineers and surveyors in New York has been signed by Governor Smith, but will not become effective until at the end of two years. The act provides for a state licensing board of five members who will meet two or more times a year. The license fee for a professional engineer is $25 and the fee for a land surveyor is $10.

A candidate for a license must be 21 years of age, and while provision is made that land surveyors must be citizens, such provision is omitted in the requirements for license to practice professional engineering. Six years of work in professional engineering or graduation from a 4-year engineering course, approved by the regents, and an additional four years' experience in professional engineering, one of which shall have been in responsible charge of work, is required for an engineer's license. The land surveyor's license requires four years' experience in land surveying.

To Build Scenic Highway in Glacier Park

Road Extending 38 Miles and Rising to Altitude of 9,000 Feet Will Cross Over Continental Divide in Rocky Mountains

A highway about 38 mi. in length, rising to an altitude of 9,000 ft., is to be constructed over the Continental Divide, Glacier Park, in northwest Montana, according to present plans. The survey for the work has been completed and it is expceted that construction will be commenced in a short time. Stephen T. Mather, Director of National Parks, states that it will take five years to complete this highway, which will be, it is reported, the most stupendous scenic highway in the world.

The proposed road will start near the head of Lake McDonald and will extend along the east side of this body of water up McDonald Creek Valley to Trapper Creek where this stream flanks the sides of Mount Cannon, then over Logan Pass, through the Hanging Gardens, along Reynold's Creek at the base of Going-to-the-Sun Mountain and along the upper St. Mary's Lake to Going-to-the-Sun Chalet Village, and then at St. Mary's Lake joining the east side mountain highway.

The completion of this road will enable tourists to make a trip of 68 mi. over hard roads from Glacier Park Station, the main gateway of the park, to the Belton, Mont., gateway on the west side of the Rocky Mountain range.

For a greater part of the distance the grade of the highway will be about 6%, though occasional short stretches will reach 8%.

May Not Increase Interest on Bonds

Supreme Court of Ohio Rules that Interest Rate on Road Bonds Already Issued May Not Be Increased—Holds Up Considerable Work

The Supreme Court of Ohio recently handed down a decision that the interest on road improvement bonds already issued can not be increased. A test suit was instituted by the Commissioners of Cuyahoga County, who directed the county auditor to place the increased interest charge of highway bonds on the tax duplicate of the affected property. This action followed the authorization by the Legislature of 6% interest on highway bonds. The decision of the court will influence, it is reported, a large part of the highway work in the state, especially that undertaken by the counties.

Bonds at 5% had been prepared and property assessments started by most of the counties of the state. Before the bonds were sold the Legislature permitted an increased rate of interest on highway bonds and the issues at 5% interest became unmarketable. In Cuyahoga County there are approximately $2,000,000 of bonds tied up.

This precedent of the Ohio Supreme Court stating that the interest rate on bonds already issued can not be raised, will necessitate extended legal procedure in the reassessment of property and the re-advertisement of bonds. It is estimated that this work will occupy at least two months, delaying a great part of the Ohio highway work for that period.

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Atlantic County, N. J., has lelt a contract for 8 mi. of Warrenite pavement at an average cost of over $70,000 per mile. The road is known as the Pleasantville-May's Landing Road and the contract includes heavy excavation and the construction of a concrete base.

A Bascule Highway Bridge is being built in Chicago, Ill., across the Chicago River at Michigan Boulevard. This bridge is eight times as large as any other street bridge in that city, contains 10,000 tons of steel, and will cost the city $5,000,000. It will be operated by means of a 450 hp. electric motor.

HIGHWAY TRANSPORTATION

Constructing Roads for Motor Truck Traffic*

BY T. R. AGG†

Motor transport as an agency for the distribution of commodities has become a recognized part of the transportation equipment of American commercial life. The continued development and extension of motor truck haulage seems destined to usher in an era of readjustment in the transportation field in the United States, comparable only to that during which the railway system of the nation was being constructed.

In a utility so comparatively new as the motor vehicle it is not reasonable to suppose that either the vehicle or the highway constructed for its use has been perfected. Improvements and adaptations of both may be expected to be numerous and of widespread influence on transportation efficiency.

Up to the present time the most important use of the motor truck, outside of the cities, has been as a supplement to rail transportation, the vehicles operating on routes paralleling the rail lines. The extent to which this will be profitable in times of normal rail facilities will depend upon many factors, one of which is the availablity of paved highways of low tractive resistance and economical grades. The other factors are of an economic character and need not be discussed herein.

Another important field of motor trucks is on transportation routes that open up territory or connect terminals not served by direct rail connections. Too little attention has generally been given to this possibility in laying out systems of state and county highways for improvement, in that too small a mileage of roads of this class has been provided.

Finally, motor transport will be employed for farm-to-market traffic on a vastly greater scale than at present. In this use the truck will to a great extent supplant the horse and the land now given over to supporting draft animals will produce human food which will all be needed. In very many states, especially those that are agriculturally productive, this development of traffic awaits only the building of suitable highways.

The continued successful utilization of motor transport for any purpose must depend upon ultimate economy and this factor will be influenced very largely by the type and location of the highways constructed and the conditions of serviceability in which they are maintained. It is accepted that the highway engineer must do his part if full advantage is to be taken of motor truck transportation.

In a broad sense, the construction of roads for motor truck traffic involves the adopting of types of improved surfaces, based on appropriate economic considerations, financing by methods that will distribute the costs in an equitable manner and accomplishing the actual construction in accordance with accepted practice in highway engineering, so far as practice has become standard, and blazing the trail wherever research and experience indicate the possibility of improved methods.

Economic considerations of great complexity are involved in the selection of the type of improvement best suited for motor truck roads, but economics too often play no part in the selection. There probably are settled convictions in the minds of many engineers and there certainly are in the minds of many laymen, as to the best type of surface for the highway that is to be used by the motor truck. But accurate data bearing on the subject are almost entirely lacking in the records of American highway engineering. The cost of transport on surfaces of various types has not been determined in a scientific manner, taking into account time, fuel costs and costs of vehicle maintenance. The cost for fuel on each of the more common types of surface is known to vary materially, but exact figures have been determined in a comparatively few cases. These considerations would be determining factors in those instances where the prices of several types of surface were nearly the same.

Of greater importance than cost of maintenance of vehicle is the cost of maintenance of the roadway surface, or more properly, the annual cost of the roadway surface during its useful life. A study of the records of initial cost of road surfaces and of the cost of maintenance and the useful life of the surface, leads one into a maze of conflicting figures. Each set of data is vouched for by those responsible for its promulgation, and yet all cannot be given equal weight. There must be accumulated a comprehensive record of these costs, based on uniform methods of accounting and reporting throughout the United States and accompanied by careful records of tonnage of traffic, before the engineer will have at hand sufficient data for the selection of the most economical types of roadway surface. Some state highway departments have made a start on such tabulation, but the records are, as yet, too few to be of much use to the engineer.

The financing of extensive surfacing projects involves very large sums of money. Conditions during the past few years have been favorable to highway financing so that comparatively little difficulty is experienced in obtaining money for road improvement. Looking to the future, however, it must be apparent that the completion of the projects now in contemplation in the United States will involve such enormous sums of money that a foundation of sane financing must be laid at the earliest possible moment.

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*Paper presented at the annual convention of the National Highway Traffic Association and the Highway Transport Conference of the National Automobile Chamber of Commerce, Chicago, Ill., Jan. 29, 1920.

†Professor of Highway Engineering, Iowa State College.

This is particularly true now that it is so generally recognized that an appreciable percentage of the highways of the nation must be of such a character that they will be adequate for motor transport, of both high speed passenger vehicles and slower speed; heavy freight vehicles. Construction of this character is costly, although the cost is probably far below the actual benefit to the communities traversed.

It may be within the province of this paper to mention briefly some factors that can properly be considered to have a bearing on the determination of a rational system of financing state-wide highway improvements.

It is believed that a system of financing that is in a general way based on distribution of cost according to benefits is justifiable and will be proof against claims of unjust discrimination in taxation for road improvement. The almost insurmountable difficulty lies in devising a means for determining where the benefits fall or the extent of the benefit in any direction.

Probably no one questions that an area that is liberally served with railroad facilities derives therefrom a community benefit that may seem to be somewhat intangible yet is nevertheless real. The benefit becomes apparent when such a community is compared with one not so favored. In the same way, the construction in any community of adequate highways of year-round serviceability for motor transport, confers a real benefit on that community. A part of the cost of such an improvement might, therefore, properly and equitably be paid from general taxation in the district served. But the possibility of the district profitably utilizing the facility will vary greatly with the nature of the industries in the district, and it is doubtful if any fixed percentage to be assessed as a general tax would be equitable for an area even as large as a state. Differences in assessed valuation of land would, however, tend to equalize taxation to a great extent, even though the rate of taxation were uniform.

There is also a direct and tangible benefit conferred on agricultural land by the construction of improved roads contiguous thereto. Lands on good roads are worth more than those not so situated and will actually sell more readily and at a higher price. The land can actually be made to show better profits when located on a good road than when not so located, because of the greater facility with which it can be operated. Therefore, a certain part of the cost of durable improvements can rationally and fairly be assessed against such lands. The percentage of the cost to be so assessed is not easily determined, but certainly should not in many cases exceed 25% of the total cost.

It probably will be admitted that the most apparent and tangible benefit from road improvement accrues to those who actually travel the highways for business or pleasure and since about 95% of the tonnage of the nation's highways is made of various classes of motor vehicles, it follows that to them the benefit of improved roads is most apparent. The cost for fuel, for vehicle up-keep and the saving in time on improved roads are real and measurable benefits. Some tests of a preliminary nature were made at Ames to determine the difference in gasoline consumption on various types of surface. While these were too few in number to be conclusive, they indicated 20% as the possible saving between an average earth or gravel road and a high class paved surface. This would mean a saving on motor operation in Iowa of upwards of $3,000,000 a year. It is equitable to require the owners of motor vehicles to contribute somewhat to the cost of the improvement of the highways and very largely to the cost of maintenance. This has been recognized in recent legislation in several states.

The amount that is added to the cost of a road because it must accommodate motor truck traffic can hardly be taxed against other than owners of motor trucks and it would seem probable that in the future both trucks and passenger vehicles will be required to bear an increasing portion of the cost of road construction and maintenance.

In the whole problem of highway finance, it is necessary to recognize that a roadway is being provided as a transportation facility that is not operated for direct income and the incentive to keep accurate account of the use of the facility in order to place the cost where the benefit is realized is lacking. Nevertheless, the great highway system desired by all progressive citizens can never be fully completed and maintained unless the financing is placed on a sound economic basis.

In the design of highways for motor transport the engineer is confronted with a problem for which he lacks some of the fundamental data for a complete solution. To begin with, he cannot predict with any assurance the size or weight of the vehicle for which he must provide, yet it is essential to an adequate design to know the maximum load for which provisions must be made. It is for that reason that steps are being taken, looking toward legal standards for the size and weight of motor vehicles.

Neither does the engineer know a great deal about the supporting power of soils under road slabs or the structural strength of road slabs of various designs. In these matters experience affords some guide to establishment of the proper design, but refinements of design that would lower the first cost are entirely within the range of possibility. In this field some investigations of great value have been completed, but much additional information is greatly needed.

In the field of railway engineering the relation between grade and curvature of the line and the cost of operation is fully established and when the tonnage of traffic is known, the justifiable expenditure for lowering grades or eliminating curvature can be computed. In the highway field no such data have as yet been obtained and the design of grades and alignment of highways for motor transport is necessarily based on unsubstantiated assumptions.

It may be permissible to digress from the subject long enough to call attention to the recent organization by the Division of Engineering of the National Research Council of a national program of highway research. The establishment of a scientific basis for highway design is a prerequisite to the economical expenditure of the funds necessary to provide an adequate national highway system. The step taken by the National Research Council will, if properly supported, supply the needed data and every organization desiring to advance the highway movement should lend support to the Research Council in carrying out the ambitious program upon which it has embarked.

Notwithstanding the handicaps under which highway engineers have worked in the matter of fundamental data relative to the construction of road surfaces for motor transport, very great progress has been made during the past five years. It may be pertinent to point out the trend in design at the present time.

Widths: The standard double track width has been increased from 14 ft., the common width a few years ago, to 18 or 20 ft. The allowance per line of traffic has been increased from 8 ft. to 9 ft. The width provisions have become more liberal in that almost no single track roads are being considered for the main routes of travel, and near populous centers many sections of three track road have been built.

Alignment: Recognition is being given to the desirability of furnishing direct routes and shortening distances wherever possible. Pleasure traffic is not so much benefited by this as is business traffic. On busy routes a saving of a mile in traveled distance between towns, represents in a year a very appreciable saving in time and in operating cost for the vehicle.

Safety considerations have also entered into the design to a marked degree and dangerous sections of road are being eliminated by relocations or by extensive grading. The elimination of short radius curves and the superelevation of the paved surface on the curve are additional safety precautions that are being generally adopted. A great many railway grade crossing are being eliminated and where that is impossible, suitable warning signs are being posted. Guard rails for protection on hills are standard for main highways.

Surfacing: The lessons of the past few years relative to the disastrous results that follow covering up poorly drained subgrade have been unmistakable. It seems now to be recognized that even a rigid pavement cannot give maximum serviceability when placed on a poorly prepared earth subgrade. The trend is, therefore, toward much more extensive and costly drainage work preliminary to the surfacing, but it is believed that money so expended adds very materially to the useful life of the wearing surface and is a justifiable expenditure.

In addition to the added care in the preparation of the earth foundation, heavier road slabs are being employed in many states and it is believed that this tendency is in the right direction. Wherever it is likely that truck traffic will develop—and apparently that is wherever roads are provided that will accommodate truck traffic—the accumulated experience of the past five years points clearly to the ultimate economy of heavy slabs.

Increasing attention is being paid to securing surfaces that are smooth, with a view to minimizing the effect of the impact of heavy loads. If the road surface is even slightly uneven, disastrous pounding occurs when the trucks travel at normal speed. This is a cause of rapid deterioration to both truck and road surface. As time passes it may be expected that the speed of freight vehicles will increase and while pneumatic tires will do a great deal to minimize impact, every reasonable precaution must be taken to secure smoothness of wearing surface.

Maintenance: A very general recognition is being given to the necessity for effective maintenance. No matter how admirable may have been the construction, a road surface subjected to motor truck traffic will not give a maximum of serviceability unless systematic and timely maintenance is provided. It will bear constant reiteration that nowhere is the old adage, "A stitch in time saves nine," more applicable than in highway maintenance. Patrol systems and the gang method have been developed to a high state of efficiency and the high degree of serviceability of a new road is maintained without marked depreciation for long periods of time. Timely maintenance if carried out persistently for a period of ears probably costs less than spasmodic efforts to make repairs at irregular intervals and certainly continuous maintenance results in the greatest average serviceability.

Dispatching and Routing of Motor Trucks

Profitable Operation Depends Largely Upon Intelligent Handling by Man in Charge of Fleet—Saves One Operator $30,000 in a Year.

The profitable operation of motor trucks depends upon dispatching and routing so as to secure maximum service, according to an official of the Pierce-Arrow Motor Car Co. The ability of the man in charge of the operation of a number of motor trucks to keep paying loads moving will measure the success of their service.

The work of the dispatcher and router should be systematic and a complete knowledge of a day's work should be had at least 24 hours in advance, if

(Concluded on page 286)

MEETINGS

Calendar of Coming Meetings

June 1-3.—Canadian Good Roads Association.—Seventh Annual Convention, Winnipeg, Manitoba, Canada. Secretary-Treasurer, Geo. A. McNamee, 909 New Birks Bldg., Montreal, Que.

June 16-18.—North Carolina Good Roads Association—Annual Convention, Asheville, N. C. Acting Secretary, Miss H. M. Berry, Chapel Hill, N. C.

National Lime Association

The National Lime Association will hold its annual convention on June 16, 17 and 18, 1920, at the Hotel Astor, New York, N. Y.

United States Bureau of Education

At the public conference to consider the extension of collegiate and vocational instruction in highway transportation and highway engineering held at Washington, D. C., by the Bureau of Education of the Department of Interior, on May 14 and 15, the following resolution was adopted.

WHEREAS, American science and industry has forged a new unit of highway transportation which is destined to bring about a far reaching change in life and thought not only in this country but in the world, and

WHEREAS, The problem of highway engineering and of highway transportation engineering are so closely interrelated as to demand not only the highest type of trained men to guide them, but an appreciation of the entire problem of highway transportation engineering are so closely interrelated engineers, and

WHEREAS, The American people have seen fit to meet the needs of highway transportation with appropriations for hundreds of millions of dollars for better highways, which can only be expended efficiently and intelligently as we comprehend to the fullest extent the economic relationship existing between the roadbed and the motive unit, and

WHEREAS, These problems, calling as they do for men of the highest collegiate and vocational preparation, can only be solved as our educational institutions are able to meet this need with increased facilities for research, study and practical application, now, therefore, be it

RESOLVED: That we, the representatives of education, industry and government, assembled in national conference at Washington, D. C., at the call of the Hon. P. P. Claxton, Commissioner of Education, to discuss this subject and to formulate recommendations concerning it, do hereby concur in the following statements:

That there is no one domestic activity of more vital import to the people of the United States than an efficient and economical administration of our highway program.

That there is a pressing demand for trained men not alone to guide this program, but also to undertake the problems of the proluction and economic use of all vehicles over the highway.

That this need can only be met by increased educational facilities for turning out these men.

That the entire subject is one which should be closely coordinated and a permanent committee made up as hereinafter designated, should be appointed by the Commissioner of Education to consider this problem in its several aspects and to bring about a fuller understanding of it on the part of the people of the country.

That the component parts of this committee should represent the Bureau of Education, the Bureau of Public Roads, the Motor Transport Corps, the state highway departments, the automotive industry, and the state or private educational institutions, as the groups best equipped to furnish the technical information needed and to work out these great public questions.

The conference also adopted the subjoined resolution relative to highway transport education.

WHEREAS, The phenomenal development of highway transportation in the United States has created a demand for men having knowledge of and training in a new technical field, which may be designated highway transport engineering, and which deals with the science, art, economics and business of transportation of passengers and commodities over highways, and

WHEREAS, The manufacturers and users of motor trucks, in this conference assembled, have stated, first, that 4,000 men should be trained in highway transport each year in universities for positions of motor truck fleet managers, sales engineers, advertisers, business administrators and highway tranport engineers; second, that short period advanced courses efficiently provide opportunities for men occupying the positions enumerated to obtain a knowledge and training in highway transport; third, that students in universities may be trained for the above mentioned position through the medium of a four-year course in highway transport engineering or group options in collegiate or technical courses, and

WHEREAS, The need is daily emphasized in every highway department throughout the land of highway transport engineers, whose sole activity shall be the practical application of highway statitics and service tests so far as the same are valuable, not only in the regulation of traffic, but to the scientific design and operation of highways and motor vehicles; therefore, be it

RESOLVED: That this Conference strongly recommends that universities and colleges offer courses in highway transport as their facilities will permit, and that at least ten universities, located in different geographical sections of the United States offer short-period advanced courses covering the various phases of highway transport, and four-year courses in highway transport engineering or highway transport options in four-year collegiate or technical courses.

———OOO———

The Morgan County Branch of the West Virginia Good Roads Association has been organized with the following officers: President, Henry Ruppenthal: General Vice President, J. W. Unger; District Vice Presidents: L. T. Weber, John Risinger, M. A. Vanorsdale, S. D. Moser, G. S. Ambrose, P. L. Kesecker, C. N. Bohrer; Secretary, Roy Cramer; Treasurer, Milo Henry.

The City of Sheboygan, Wis., has painted white all the posts of the approaches to the bridges over the Sheboygan River for the protection of traffic traveling at night.

Dispatching and Routing of Motor Trucks

(Concluded from page 284)

possible. Using the information available, a schedule should be charted which will eliminate all waste time, distance and motion. To effect the greatest efficiency of operation, the router must know the topography of the scene of operations and the density of traffic at various points at differentt hours of the day. Hours of congestion at shipping and delivery points also influence the amount of time taken by a truck in loading and unloading.

Congestion of traffic at any point is to be avoided and especially at the loading station or shipping platform. The dispatcher aims to keep his trucks moving past the shipping platform in a cycle, eliminating the line of idle trucks waiting to be loaded or unloaded.

To aid him in assigning the loads to units of the fleet and to map out time saving schedules for their operation, the dispatcher usually makes use of a dispatch sheet. This record will show at a glance the nature of the load, the distance, the time of departure, the destination and the probable time of return of the truck.

That the installation of an efficient dispatching system is profitable is proved by the experience of an operator of 24 large trucks, who in one year saved nearly $30,000 in operation and maintenance expense through the elimination of idle time and wasted travel.

New Jersey to Weigh Motor Trucks for Overloading

The New Jersey State Highway Commission will purchase three platform scales and install them in various parts of the state to combat the overloading of motor trucks. Trucks which are suspected of being overloaded will be weighed and it is expected that the money secured through fines and increased license fees when trucks are found to be carrying loads in excess of those for which they are licensed, will be sufficient to pay for the scales.

The roads near the centers of population have been seriously damaged at many points and county officials have appeared before the State Highway Department for a remedy. It is believed that in some instances motor trucks have carried loads several tons in excess of their licenses and in excess of that permitted by law.

Local Regulation of Motor Trucks Proposed in Louisiana

Gives Police Juries of Parishes Power to Limit Loads and Place License Tax on All Motor Trucks Operated as Common Carriers

A bill giving the police juries of the parishes of Louisiana power to limit the size of loads carried over the roads and to place an additional tax on automobile trucks operating as common carriers, is to be introduced in the Legislature of that state by W. A. Nunez, of St. Bernard.

"The administration," said Mr. Nunez, "is committed to a good roads policy and I believe my measure will go a long way toward preserving the good roads of the state. Some of the automobile trucks and trailers operating over the roads in my parish are as high as 15 tons capacity and their effect on the roads soon becomes apparent.

"My bill is in no way aimed at the truck farmers and other producers who transport their products to market in auto trucks and trailers, but is aimed at companies operating monster trucks as common carriers and not paying any license to the parish as such. Good roads are being constructed throughout the state and ought to be protected."

PERSONAL MENTION

W. K. Seitz has been appointed city engineer of St. Joseph, Mo.

John Neville has been appointed city engineer of Pocatello, Idaho.

Otto Genglin has been appointed city engineer of Texarkana, Tex.

H. S. Baker has been appointed county engineer of Spokane County, Washington.

Harvey J. Sarter has been appointed county engineer of Siskiyou County, California.

William A. Hansell has resigned as superintendent of public works of Fulton County, Georgia.

George Engel, Commissioner of Public Works, Detroit, Mich., has resigned to enter business.

John Brumbaugh has succeeded John P. Hacker as county road superintendent of Huntington County, Indiana.

OBITUARY

Arthur B. Bellows, First Vice President of the Pittsburgh Testing Laboratory, Pittsburgh, Pa., died on April 17.

John C. Winston, Director of Public Works of Philadelphia, Pa., died recently at Germantown at the age of 63 years.

Alexander von Babo, Engineer of Bridge Design in the Chicago Department of Public Works, died recently in that city. He was born in Heidelberg, Germany, in 1854 and came to America in 1881. He was associated with various engineering companies until 1889, when he was appointed to the position which he held until his death.

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

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*Illustrated article

White Trucks

Do The Most Work
For the Least Money

The White Company
Cleveland

This Dustless, Weedless Road Will *Not* Rut, Ravel or Wash Out

The secret of its lasting, wearing surface is due to the fact that the highway engineer who constructed it realized that he must retain the filler in the top course. To do this it was necessary to keep the top course moist until the cementing qualities of the stone had sufficient time to be rolled and compacted together by the traffic. To accomplish this he used

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Granulated
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The material has all the advantages of other preparations but none of the disadvantages. It is clean, odorless, dry, does not track, keeps the road in a damp, cool condition, drawing the moisture from the air at night and retaining it during the day. This prevents deterioration and raveling.

Freight rates on Solvay Calcium Chloride are comparatively small and no heavy, cumbersome machinery is necessary. With a good spreader weighing about 400 pounds a satisfactory job can be done at a cost of about $.0001 per square yard. This can often be reduced if work is done by a regular patrolman.

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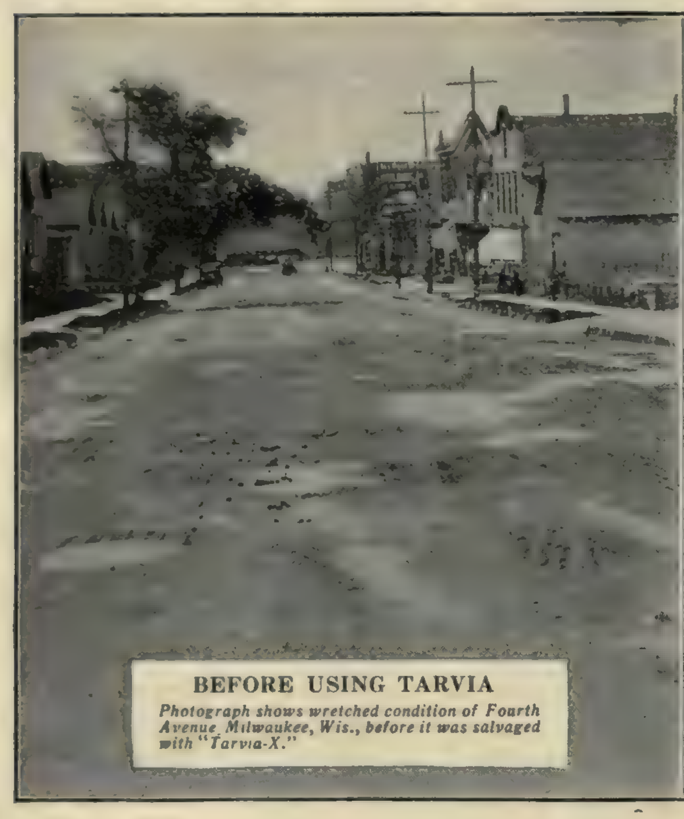
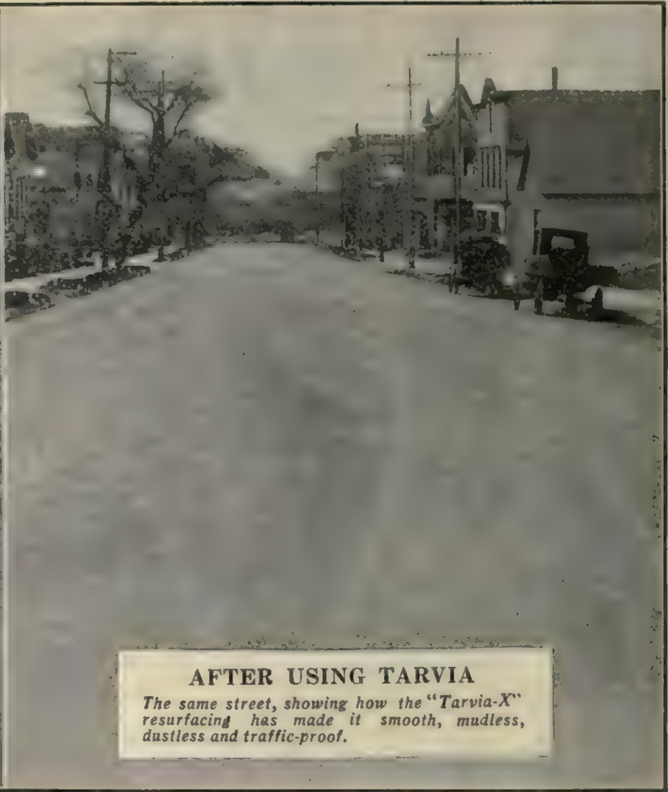


BEFORE USING TARVIA

Photograph shows wretched condition of Fourth Avenue, Milwaukee, Wis., before it was salvaged with "Tarvia-X."



AFTER USING TARVIA

The same street, showing how the "Tarvia-X" resurfacing has made it smooth, mudless, dustless and traffic-proof.

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CONSTRUCTION TRANSPORTATION MAINTENANCE

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Bitminous Surface Treatment*

By CAPT. M. C. WELBORN†

In practically every case the question of the type of road to be built resolves itself into the question of what type will be the least expensive to maintain under the traffic to which the road will be subjected, and the word "maintenance" must be taken literally and must mean not only keeping the road surface smooth, firm and capable of sustaining the loads in all weather, but also maintaining the original thickness of the surfacing.

When considering the advisability of a bituminous surface treatment, it is absolutely necessary to consider the maintenance cost of this surface and if that is found to be greater than the cost for the untreated surface, it is not good business to apply the treatment.

In a former discussion of this subject by the writer it was suggested that this type of surface was suitable for highways carrying as many as 2,500 vehicles a day, but in the light of our past year's experience it is evident that such a surface cannot be recommended for a traffic of over 1,500 vehicles a day, and then only upon a very heavy and very

VIEW ON THE WEST MONTGOMERY ROAD, HARRIS COUNTY, TEXAS—SURFACE TREATED WITH ASPHALT IN SEPTEMBER, 1918—15 MILES OF ROAD SURFACE TREATED WITH ASPHALT IN COUNTY.

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*Abstract of a paper presented at the meeting of the Texas Roadbuilders' Association, Austin, Tex., Feb. 18-20, 1920.

†Division Engineer, Texas State Highway Department.

thoroughly compacted base of strictly first-class gravel or broken stone.

When it is desired to construct a bituminous surface on an old gravel surfaced road without change of grade and with only the resurfacing or restoration of the gravel surface, the drainage should be carefully investigated and if it is found inadequate steps should be taken to cure the defects. Expense and effort used in building a bituminous surfaced road on a poorly drained grade are absolutely thrown away.

A bituminous surface treatment costs from $2,000 to $5,000 per mile and the engineer should be certain that the surface to be treated is thoroughly solidified and that no further settlement will occur. It is comparatively inexpensive to repair small depressions in a gravel surface with gravel, but the only way to properly take care of the depressions in a bituminous surfaced road is to tear up or remove the bituminous surfacing and reconstruct the base and then restore the bituminous surface—an operation much more expensive than repairing the gravel surface.

In this vicinity it has not been customary to subdrain the base under gravel or stone surfaced roads, but this work must be more carefully looked after in the future. More attention should also be given to building shoulder drains so that water accumulating beneath the surface will be carried to the ditches.

It is well known that water is the natural enemy of bituminous material, and no bituminous surface will stand up under traffic for more than a short period if water is permitted to stand on its surface. During the past year much bituminous surfaced road has failed on account of the crown's being too flat. It is very difficult, especially under traffic, to construct a surface so true that no small depressions will appear, but it is the writer's opinion that much trouble can be eliminated by planning our cross-sections with a steeper crown than has heretofore been used. No bituminous surface should have a transverse slope of less than ½ in. to 1 ft. and possibly ¾ in. to 1 ft. would be better. Heavy traffic will act to reduce the crown of a newly graveled road in a very short time, and it will probably be best to construct a gravel base with a somewhat steeper crown than is intended for the finished work and to depend upon the traffic to reduce it before the bituminous surface is applied.

The principal points to be observed are:

1. Thoroughly drain the grade. If possible have all surface water run off the right of way.
2. Thoroughly drain the base so that no water will accumulate under and in the surfacing material.
3. Thoroughly drain the surface of the road so that no pools will stand on the bituminous surface.

If these are strictly observed, and the base constructed of good material and sufficient thickness to carry the traffic, the bituminous surface will be a success. The neglect to observe any one of these points is almost certain to result in the failure of the road.

In the experimental stage of bituminous surface treatment work, some of its most optimistic advocates applied it to any kind of a base that might be in existence. Little or no attention was paid to the thickness of the surfacing and much work was done upon rough and uneven gravel surfaces which were in no condition to receive treatment. Naturally, many failures resulted. While this experimental work was expensive, it provided us with object lessons and brought out the objectionable features to be avoided.

It has been found from these experiments that bituminous surface treatments can be successfully applied to macadam and gravel surfaces, but that they are not successful when applied to sand-clay, chalky limestone or adobe, and is frequently not successful on shell surfaces.

The reason for failures on sand-clay, chalky limestone and shell surfaces is probably that the bond is really not effective, because when a strain tending to destroy the bond comes upon the surface, a thin sheet of the base is pulled away from its main body and then the surface coat cannot resist the tendency to lateral displacement. A sand-clay, chalky limestone or shell base can be put into condition to receive a bituminous top by scarifying into the upper 3 or 4 in. of it clean gravel or broken stone. The writer has never seen this done, however, and of course cannot recommend it for general use.

We find a great variance of opinion as to the requisites of a good road gravel and surfacing material. There is often used a gravel that contains high percentages of clay or calcareous material that sets up quickly under traffic. A base constructed of such material, before being bituminated, should be subjected to traffic in order to allow the fine material a chance to dust up and blow away or be washed from the surface. Any quick setting gravel should be looked upon with suspicion. Many failures in bases constructed of this class of material are no doubt due to internal abrasion. In order to guard against shifting and internal abrasion, it is necessary to use a material that contains a high percentage of tough and durable stones and a minimum amount of fine material, such as clay, sand or calcareous dust.

Before a bituminous treatment is applied to any base, it should be definitely ascertained if the surfacing material in the base is thick enough to withstand the traffic after the bituminous surface is applied. It often happens that a gravel base that is perfectly smooth and hard has been worn down until it is only 3 or 4 in. in thickness, and if a bituminous treatment is applied to this base, it is certain to disintegrate under heavy traffic.

The expense of a bituminous surface treatment is not warranted unless traffic is comparatively heavy, and for traffic such as will warrant the application of a bituminous surface treatment, a minimum of 6 in., compacted, of good stone macadam, or 8 in., compacted, of good road gravel is necessary. In the black land sections of Texas, even these thicknesses are not sufficient.

If the base is too thin, new material should be added to bring it up to the required thickness, and immediately before adding this material the old surface should be thoroughly scarified in order to insure a perfect bond between the two courses.

Extreme care should be taken to finish the base as near to the theoretical cross-section as possible and to have it free from transverse waves.

It is the writer's opinion that any new gravel surfaced road should be subjected to traffic for some months immediately before the bituminous treatment is applied, as it is hardly possible to thoroughly compact this surfacing by rolling or by any method other than the action of traffic.

One of the principal requisites of this class of surfacing is that it must be firmly bonded to the base. In order to insure a perfect bond at all points, it is necessary to remove all the dust before application of the bituminous material.

The base is generally cleaned with a rotary street sweeper, but it is not well to depend entirely upon the action of the sweeping machine. While it will remove most of the dust there will be some dust pockets left by it, and immediately before the application, the surface should be carefully gone over and these pockets removed by hand sweeping.

If the appication is made by a machine with jets that play directly upon the surface and with sufficiently high pressure, no other cleaning of the surface is necessary. If a different kind of machine is used, the blower or air pressure method is necessary.

There are several different methods of applying bituminous surface treatments, but in all in which liquid bituminous materials are used the general process is as follows:

1. Carefully clean the surface, removing all dirt, dust or other foreign material.
2. Apply the bituminous material uniformly over the surface in one or two applications, depending upon the process adopted.
3. Cover the bituminous material previously applied with sand or stone chats.
4. In case heavy bituminous material has been applied and large sized stone particles have been used for cover material, thoroughly roll the surface with a roller weighing from 5 to 10 tons.

In the Texas State Highway Department specifications, two grades of tar and four grades of asphalt have been specified. They are used in a number of different combinations, some of which are as follows:

(A) A light coat of about .3 gal. of refined coal tar (b), followed by an application of about .3 gal. of refined coal tar (a). With these, cover material is applied only after the second coat.

(B) The application of about .3 gal. of refined coal tar (b), followed by an application of from .3 to .4 gal. of asphaltic oil Class A or Class Aa, the cover material being applied only after the application of the asphalt.

(C) The application of two coats of from .3 to .4 gal. each of the light asphaltic oil, Class D, covered after each application with coarse sand, pea gravel, or stone chats under ½ in.

(D) A two-coat application of asphaltic oil, using for the first application either Class D or Class C and for the second application either Class A or Class B, with cover material added after each application.

(E) A single application of Class A asphalt of from .4 to .6 gal. and the application of rather coarse stone chats for cover material, generally followed by rolling.

It is not necessary to put cover material on light tar, because in a few hours it will set up enough so that it will not stick to the wheels of the distributor, but it is necessary to apply a certain amount of cover material to an asphaltic treatment in order to prevent sticking to the wheels in making the second application.

Coal tar treatments set up quickly and give but little trouble by bleeding, but in this climate the material will begin to disintegrate and crumble after about eight months or a year and the surface must have a retreatment. Asphalt sets up very slowly and requires months of careful attention in order to keep down excessive bleeding, but an asphalt surface will not disintegrate for two or three years and if the original application is well put on it should not require retreatment under two years.

In the experimental stage of this class of work, many different materials were used for cover. Much coarse sand has been used, but the present tendency is to use coarser material, and in some of the best surface treatments a graded stone has been used which runs as large as 1¼ in. Some coarse gravel has also been used, some of the particles running as high as 2 in. During rolling, material of this kind crushes to rather fine particles, but this material has not proven satisfactory.

The composition of a completed bituminous surface coat is practically the same as a sheet asphalt, bituminous concrete or bitulithic pavement, the only difference being in the method of mixing. It has been found that in a machine mixed pavement, internal abrasion takes place and the softer stones, of course, are affected much more than the harder ones. Similarly in surface treatments we may expect a soft stone cover material to disintegrate within the surface itself and on account of its comparatively slight thickness, we may expect this action to take place to an even greater extent than in the regular bituminous pavement. The harder stones, therefore, are much to be preferred for this class of work.

Another point against the use of the softer stones is that it is absolutely essential that no water touch the base and in order to prevent this an impervious surface must be constructed. The larger, comparatively soft stones are not only cracked and broken by rolling and traffic, but are pushed through the bituminous coat into the gravel beneath. The cracks left conduct the water through to the base and cause its disintegration and the subsequent destruction of the surface.

In curing an asphalt surface, it is necessary from time to time, to add new cover material and it is the writer's opinion that while the original cover material should be a hard, graded stone, the material added to prevent bleeding should be sharp, coarse sand. This fine material in working into the surface will not cause a disturbance or displacement of the stones in the original surface, but will fill in the voids and aid in producing a uniformly impervious surface.

Before the bituminous material is applied, the cover material should be distributed along the edges of the road at convenient intervals for shoveling directly on to the surface. It should be applied with a sweeping or spreading motion. Some skill is required to distribute it evenly and uniformly and careful supervision should be maintained to see that an even distribution is obtained. Machine distribution would be possible, though such a method would probably be slower than hand distribution, because the loading of the machine would require considerble time. The writer does not know of any case where machine distribution of cover material has been attempted.

In general, it is best to do bituminous surface treatment work in the spring or early summer, so that the surface will be well set up and cured before the winter rains.

Rock asphalt surfacing is constructed of finely crushed rock asphalt with a small amount of light asphaltic oil as a flux. The base is prepared as for other surface treatments, and four or five days before the application of rock asphalt, the base is oiled with a coat of about .2 gal. per square yard of a light asphaltic oil and thrown open to traffic without the addition of cover material. Traffic soon works the oil into the base and will pick up the surface in many places where the dust was not all removed by the original sweeping. Four or five days under traffic will serve to bring out all such places.

Immediately before the application of the rock asphalt, the surface is again swept and covered with from .1 to .15 gal. of asphaltic oil, the same as that used for the first oiling, after which the traffic is not allowed over the surface until after the seal coat is applied.

For this class of surfacing the rock asphalt is crushed to the necessary degree of fineness, depending upon the thickness of the course to be applied, the dust is screened out and the coarser particles mixed cold in a rotary mixing drum with light asphaltic oil at the rate of about 4 gal. of flux to 1 ton of rock. This mixture is then spread upon the prepared surface to the desired thickness, after which it is thoroughly rolled and compacted.

After the first rolling has been finished, the dust previously screened out from the crushed asphaltic rock is spread over the compacted rock surface in a thin layer in such a manner as to more than fill the voids in the surface, after which the surface is again rolled. Traffic should not be allowed over the road until the seal coat has been applied and rolled in.

Like the liquid asphalt surfacing—and for the same reasons—this surface should be applied during the spring and summer months.

The maintenance of a bituminous surfaced road calls for more careful supervision than any other class of road. Ditches and drains must be kept open and water must not be allowed to accumulate, either on the surface or in the ditches. Small pick-ups or imperfections in the treated surface must be looked after and patched as soon as they occur. The maintenance should be continuous and not periodic. As soon as the surface is constructed, definite arrangements should be made for its maintenance, for if this is not done the results will be most unsatisfactory.

———ooo———

The Director of the Good Roads Association of Japan has secured permission to translate the book by Charles E. Foote, entitled, "Practical Road Building," for circulation in that country.

Plans are Being Made in Harrison County, West Virginia, for the launching of a campaign for an issue of $4,000,000 of road bonds by that county. Petitions will be circulated for a special election for a vote upon the question.

Governor Smith of New York on May 25 signed the Walters bill appropriating an additional $1,000,000 to be used by the New York State Bridge and Tunnel Commission in carrying on its work for the construction of the vehicular tunnel between New York and New Jersey.

The War's Development of Motor Transportation*

By **WINDSOR T. WHITE**†

A discussion of the war development in motor transportation might lead into one of two antithetical subjects, either the development in civil pursuits or the development of the prosecution of war, depending upon the angle of the proposition which it is desired to present. As the war is, in a measure, a matter of history it would seem that we could best be occupied with the problems of peace and consequently be interested mostly in the war development of motor transportation from the viewpoint of its effect on commercial truck operation. In this matter the war experience produced much of value in revealing those latent possibilities of motor truck operation which exploitation had failed to demonstrate. Although the motor truck manufacturers were fully aware of these things, they were not always able to convince prospective truck users of the facts, largely because of the natural opposition to innovation which has operated for centuries to retard human progress. The performance of motor trucks in war service has done much to change this mental attitude and has brought out many facts of value in the application of motor vehicles to commercial service.

On the matter of "motor truck design" many interesting things developed. Of these the controversy pertaining to the development of a specially designed truck for war purposes as against the use of standardized commercial vehicles occupied the attention of the truck industry and the Government to considerable length. Its final conclusion merely substantiated a fact which has been patent to the motor truck manufacturer ever since the inception of the industry, that is that blue-print specifications do not guarantee performance and that regardless of the quality of the engineering talent employed, successful motor trucks must combine with this engineering those compromises—termed "coordination of parts"—which practical operation has shown to be essential to successful operation, and which demonstrated their correctness only in a comprehensive record of performance in service. This was forcibly presented in France where the best results were obtained from trucks designed for commercial service rather than from those whose engineering features enabled them to do unusual things. The most successful vehicles in the service of the army, either commercially or in the field of operation, were those which were the most dependable and whose construction was the simplest.

On the matter of "truck operation" the war taught many lessons by which to profit. One of these is that motor vehicles cannot be successfully operated under horse wagon methods. This is a principle truck manufacturers have been endeavoring to instill for years and which it has been found difficult to convey to the prospective truck user whose usual procedure upon purchasing equipment has been to entrust this supreme crystallization of the best engineering talent which the industry could supply to a barbarian stable boss for final judgment, with strict admonition to keep track of its costs and report results. The handling of motor transportation is a scientific problem, involving essentially the same factors as does railroad transportation, and to be successful must be run by system. The operation of trucks by the British and French armies demonstrated this with complete thoroughness. Every movement was planned in detail and each was guarded by a service that led out over the field of operation through telephone systems over which the progress of troop movements and instructions were transmitted to commanders. In this way, the entire motor transportation divisions of the British and French armies were operated under a dispatching system similar to that employed in railroad practice. This method of truck operation is practical in its proper adaptation to most motor truck problems in commercial business, and its use results in economies which cannot be otherwise obtained.

The operation of motor trucks under the exacting demands of war brought about a keener realization of the possibilities of power vehicle service than did many other contributing factors. In France and Flanders, in Belgium and Italy motor trucks withstood an acid test for ability and endurance which years of commercial service could not have produced. Millions of men from all walks of llife and from all parts of the civilized world witnessed the astonishing demonstration and told the story to the world. Thus the motor truck became known as a highly developed piece of transportation equipment possessing unexcelled qualities of durability, dependability and economy, and ceased to be viewed, in a measure, as a mechanical contraption of questionable value.

In the United States the demands for transportation created a serious state of congestion of roalroad traffic, and motor trucks were called upon to bear a share of the burden thus imposed. Intercity and long distance motor truck lines were rapidly established and return loads bureaus were inaugurated in a number of states, in an effort temporarily to relieve the situation. The result of this expedient was to establish the economy and value of motor truck service in intercity hauling and to determine their limits of profitable operation. The unqualified success of intercity hauling demonstrated the possibilities of this class of truck service and showed that motor trucks offered a solution to many traffic problems by supplying the kind of equipment needed to provide the class of transportation which our industrial and social economics require. This service showed further that the power wagon offers a solution of the complexity of our transportation problems which the centralization of industry and consequent unbalancing of population between rural and urban communities—that is, between food producers and food consumers—has brought about. To any one who is at all familiar with the development of transportation in this country as a whole, it is quite obvious that we have been approaching a time when future progress will demand a new and better expansion of transportation which, because of its very character, railroad service is unable to supply. The type of transportation required is one which can readily adapt itself to changing conditions, and which in large measure is unrestricted as to its direction of operation. This is a problem which has claimed the attention of economists who have viewed with alarm the breaking down of our transportation systems through governmental meddling and restriction, and for the partial solution of which the motor truck has something to offer. Because of the value of motor truck operation in our transportation system it is pertinent that we review the development of our industrial and social conditions, that our problems may be faced and solved. While this may be a digression from the original subject under discussion, it would seem that this assembly can be best occupied with the consideration of the vital problems of the day rather than with contemplating the effect of war on motor transportation.

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*Paper presented at the eighth annual meeting of the Chamber of Commerce of the United States of America, Atlantic City, N. J., Apr. 27-29, 1920.

†President, The White Company; Vice President, Motor Truck Division, National Automobile Chamber of Commerce.

The cheapness of railway transportation and its rapid expansion have permitted the concentration of manufacturing industries on a large scale at points convenient to their raw material or for the ditribution of finished products, and has opened vast uninhabited regions to immigration and prosperity. By bringing the products of distant regions to the toiling millions of the cities, railways have made it possible for cities to increase in population and prosperity, and the entire civilized race has been blessed by the greater economic efficiency thereby obtained.

This centralization of population was not without its drawbacks, and soon housing problems were created which seriously threatened further development of the industries of the communities which railway transportation had made possible. The frontiers of the city pushed farther and farther into the surrounding country. Distances within the populated areas became longer, and the people were forced to establish their dwellings remote from their places of employment. This has resulted in an unbalancing of the economic distribution of the population. Migration from the rural districts to the cities, and the influx of foreign labor, drawn thither by the promise of high wages, have brought about a serious condition of affairs and we find that in 1880 the ratio of city dwellers to country residents—that is to say, the ratio of food consumers to food producers—was approximately as 30 is to 70, whereas in 1920 conditions in this regard were nearly reversed. In other words, in 1880 the proportion of people producing food was 3½ times greater than it is today. This has resulted in a condition which threatens to overthrow our entire economic equipoise, as is evidenced by the crop situation and production. Considering the matter of wheat alone, in 1880 the proportion of population in the United States as compared with Europe was very small, while in 1890 the population of Europe was three times that of North and South America combined. Consequently Europe offered a market for our surplus production of wheat, which encouraged extensive cultivation of this crop. Today the domestic requirements of wheat are about 90% of the average yield of the five years from 1909 to 1913, and at the present rate of consumption the prewar scale of production would only show a substantial surplus over domestic requirements in about one year out of five. This development is significant in its bearing upon the future state of the country, for when the increase in population is considered as a whole and when the consequences of the disproportion of distribution appear in their full meaning, it is not to be questioned but that the passage of time will see the transition of this great country from an agricultural to a manufacturing nation. Should the trend continue in the same general direction which it has followed in the past, it is not improbable that the economic conditions in the United States may become entirely upset, and that we shall stand before the world as a barterer, exchanging our manufactured products for those foods which our fast diminishing rural population is unable to supply. Should this occur the United States will only be able to purchase food at a high price, measured in terms of the labor required to produce her own exports of manufactured products.

The value of farm products, which includes all cereals, vegetables, cattle, dairy products, fruits, etc., has steadily risen; that is to say, the producer is either getting more for his labor or is raising in greater abundance, thus increasing his total income. Both of these factors have undoubtedly exerted their influence. However, the possibilities in this direction largely depend upon the available facilities for transportation. Without transportation the vast farming areas of the country would not have been accessible for cultivation. It is equally true that without transportation the centralization and development of industry would have been impossible. Consequently the development of the country and conservation of our institutions rest upon the completeness and stability of our transportation facilities. To all the processes of industry and commerce the service of transportation is essential, and it is a

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GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

Founded January, 1892

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Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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Vol. XVIV JUNE 9, 1920 No. 23

KEEP ON BUILDING ROADS

Two weeks ago GOOD ROADS took occasion to point out the folly of any curtailment of road work and to urge continued activity in the improvement of the country's highway system. Because the need of keeping on with highway work can not be urged too strongly or too often, we again advert to the matter.

One of the specious arguments put forward in support of a policy of curtailment is that a slowing up of road work will divert labor to farms where it is sorely needed. Without questioning the necessity of finding farm labor, it can be asserted safely that little if any relief would be afforded the farmers were road work to be stopped—except possibly during harvest time.

In the first place, comparatively few of the laborers, either skilled or unskilled, who are or will be working on the roads would seek work on the farms or could be induced to turn to that work unless forced to it by actual want. In the second place, very few of them would be even passably efficient farm hands.

There is another phase of the matter of food production that must be taken into consideration. The farmers need transportation facilities almost as much as they need labor. Shortages and high costs of farm produce always have been partly due to inadequate methods of distribution. This season, many farmers are reducing their acreage, partly because of the shortage of farm labor and other good and sufficient reasons and partly because some of them have been caught in the wave of dissatisfaction and unwillingness to do an honest day's work for a reasonable return that has swept over the whole country as one of the reactions of the war. But even with the decreased production that now seems inevitable, it is more than likely that a no inconsiderable part of the country's crops will rot on the ground, as usual, because of the diffiiculty of getting to market.

The remedy for these distribution difficulties lies in more good roads. And this alone is sufficient reason why we should keep on building roads.

BITUMINOUS SURFACE TREATMENTS

A very considerable portion of the country's improved road mileage consists of water-bound macadam and gravel. This mileage is so great that replacing the present surfaces with high class pavements can not be accomplished for some time. In addition, more roads of these two types are being built every year where the traffic will not justify the cost of better pavements or where the funds obtainable are insufficient for more expensive work.

Under many conditions it is good practice to apply bituminous surface treatments to water-bound macadam and gravel roads, and for that reason particular interest attaches to the abstract of a paper on "Bituminous Surface Treatment" that is printed elsewhere in this issue. While it refers mainly to practice in Texas, most of what the author has to say is of general application.

Bituminous surface treatments serve several useful and important purposes. They conserve the road and facilitate traffic. They also lay the dust, a function of very great importance in some localities. Their cost is not excessive, under ordinary circumstances, and if properly applied, their cost is returned several times in the benefits that result.

Several points worthy of special note were made in the paper to which reference has been made. One of them is the importance of making the applications early in the season. The contrary practice is too often followed—with detriment to the road and the loss to the traveling public and to the community of the benefit of having the surfacing in place during the season of heavy traffic.

Another point made by Capt. Welborn is that surface treatments should be applied only when the cost of the maintenance of the bituminous surface will be less than that of the untreated surface. This could well be amended, however, by making the criterion the total cost—though the results would usually be the same.

A third point—and a most important one—is the necessity of continuous maintenance, maintenance beginning upon the completion of construction.

Highway Will Develop New Jersey Meadows

Newark Plans to Build Two Miles of Road Costing $500,000 to Develop Industrial Sites in the Port Newark Meadow District

Planning to develop the Port Newark meadow zone for industrial sites, the city of Newark, N. J., has advertised for bids for the construction of the proposed Haynes Avenue Highway across the meadows from Weston Ave. to Port St., a distance of 11,000 ft. This land is very swampy and it is estimated by Arthur J. Simpson, Engineer in charge of the port development, that the draining and grading will cost about $500,000. Should the bids received for the work be acceptable, a part of the purchase price paid by the Government for the quartermaster's depot site at Port Newark will be used. The city has more than $1,000,000 on deposit in this account.

The work will take about one year and a half to complelte, incuding the buiding of bridges over the creeks and sewers that cross the line of the proposed highway and constructing the earth fill. Upon completion this road, it is stated, will furnish means of access from the city to more than 80 factory sites.

Beginning at Weston Avenue, the line of Haynes Avenue runs directly northward, just east of the Waverly yards of the Pennsylvania Railroad, as far as Peddie St. At this point it turns out toward the bay and continues to a point just west of the tracks of the Central Railroad of New Jersey, connecting with Port St. Under an agreement with the city, the Pennsylvania Railroad is obligated to bridge its tracks at both Weston Ave. and Peddie St. This will provide entrance from Frelinghuysen Ave. to Haynes Ave. at two points.

Asphaltic Roads in Arkansas

The State of Arkansas has undertaken a road program which will mean 9,000 mi. of improved highways to the credit of that state when the work has been completed. Three hundred miles of this project have already been constructed; 4,300 mi. are now in the process of building; and 4,400 mi. are in the preliminary stages of organization. The program will include every type of street and highway construction from the graded dirt road to the higher types of pavement.

Of the entire 9,000 mi., 1,089 mi. will be of asphaltic construction. This means that there will be a greater mileage of asphalt roads than of any other type with the exception of gravel.

The greater part of the asphaltic construction will be asphaltic concrete on stone or concrete base. This type of pavement has for the last ten years demonstrated its practicability on country highways and city streets. It is economical in first cost, is easily and cheaply maintained, and presents a very pleasing surface to the eye.

Of the work under contract and construction in Arkansas the following summary shows the mileages of the various types of surfacing.

Type	Miles
One-course Portland cement concrete	192
Asphaltic concrete on stone or concrete base	629
Penetration macadam	460
Water-bound macadam	560
Gravel	2,209
Earth	250

The War's Development of Motor Transportation

(Continued from page 292)

plain duty of the people of this country to keep it from "loss, decay, or injury," and to preserve it from destruction. In this connection the motor truck offers a partial solution to the transportation problem, which will bear examination.

As the centralization of industry followed the expansion of railways, cities and towns naturally sprang up along the railroad lines. The growth of these communities and their increasing demand for larger quantities of food naturally stimulated the development of food producing areas adjacent to these consuming centers. As the cities grew, these producing areas not only moved farther and farther away, but they also expanded to meet the demand for increased production caused by increased population. This development, like the proverbial flea on the flea, proceeds ad infinitum. Consequently gardeners and dairy farmers, who a few years ago were faced with a short haul to the nearby market, now find the horse-drawn vehicle of other days entirely inadequate to cover the increased distance to cities where they dispose of their products. At the same time the delivery areas of the city merchant and of manufacturing industry have all expanded with the changing conditions of our political economy. These changes have not only brought about a greater demand for transportation facilities, but have created a congestion of traffic which has claimed the attention of railroad operators and engineers for the past ten years, and at times has become so acute as greatly to impede freight traffic movement.

As long ago as 1912, the late James J. Hill said, "I confess I have not yet found a satisfactory solution to the riddle of city terminals. It is a puzzle that increases in complexity and complication as cities grow." Much of this condition is caused by the influx of what is known as the "short haul traffic." This refers to the shipment of commodities between relatively adjacent communities, and includes a large

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EQUIPMENT—TRADE—MATERIALS

The Selection of Pumping Equipment

By R. E. S. GEARE*

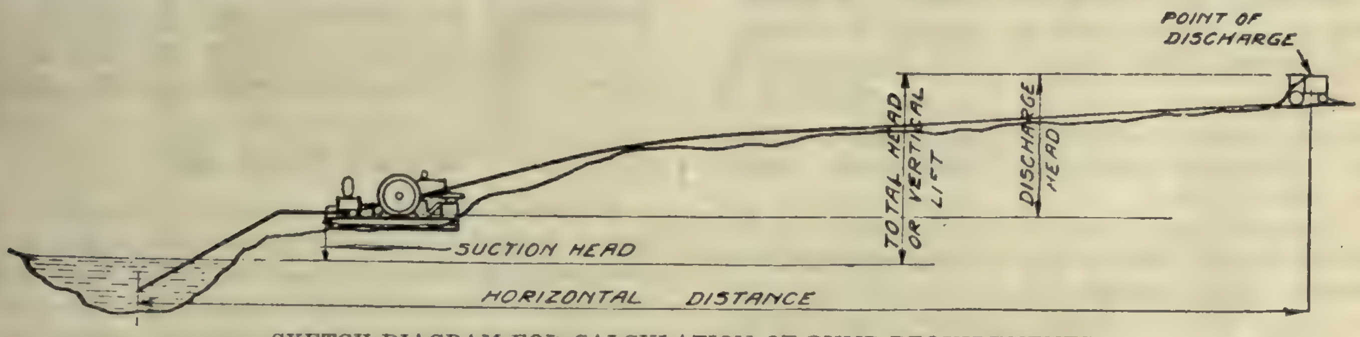
Many contractors encounter difficulty in maintaining a sufficient water supply on road jobs because of the use of pumping equipment that is unsuited to their needs. A story is told of one contractor who set up water pumping equipment with 15,000 ft. of 2-in. pipe and a pump. His lift was only 60 ft. but his friction head was over 750 ft. The pressure it was necessary to put on the pipe to give the desired flow of water at the end of the line was so great that the pipe could not stand the strain and it was necessary to install a tank and another pump to relay the water.

Another contractor who thought that water always runs down hill located a supply of water 1,000 ft. above his job, with a good incline down to the work. He decided to let the water flow down by gravity and laid 1,000 ft. of 1-in. pipe, forgetting, for the time at least, that friction is a force that must be taken into consideration when figuring water supply. He was shortly disillusioned, however, for he found that he was getting but a dribble of water on his job. He was faced with either tearing up all the pipe and laying a larger size or installing a pump and pumping the water down the hill. He decided on the latter course and pumped the water down to his job.

In the construction of concrete roads the water supply is important. Very often the machinery and gang are tied up because of the lack of water, a lack that could have been avoided entirely if sufficient attention had been given beforehand to the selection of pumping equipment. And although most engineers select the proper pumping machinery, there is one here and there who does not fully realize the importance of this part of the equipment. Consequently, losses occur in the use of pumping outfits not adapted to the purpose for which they are used.

Diaphragm or splash pumps are made for pulling purposes only, and their scope of action is limited to the suction head. These pumps are used ordinarily to empty sewers, ditches and similar openings. On the other hand, centrifugal and plunger pumps are used where lifting and forcing are required. While these two last mentioned pumps are used for the same general purposes, their scopes are different. In the case where a small volume of water is desired at a high pressure, the plunger pump is used. Where a large volume of water is required the centrifugal pump operates with good efficiency at comparatively low head.

In determing the theoretical horse power necessary to elevate water to a given height, the number of gallons to be delivered per minute is multiplied by 8.33 (weight of 1 gal. of cold water) and this result multiplied by the total head in feet, the total head equalling the actual head plus the head due to friction. This result is divided by 33,000, as 33,000 lb. of water elevated 1 ft. in 1 minute equals one horse power. The actual horse power is determined by dividing the theoretical horse power by the efficiency of the pump.



SKETCH DIAGRAM FOR CALCULATION OF PUMP REQUIREMENTS

For example, it is required to elevate 100 gal. of water per minute to an elevation of 100 ft. through 200 ft. of 2-in. pipe, with two elbows and one valve in the pipe. By reference to friction tables we find that the friction in the 200 ft. of pipe is 43.5, that in the two elbows 3, and that in the valve 1.7. The sum of these, 48.2, added to the elevation, 100, gives a total head of 148.2. The theoretical horse power required, then, is

$$\frac{(100)\ (8.33)\ (148.2)}{33{,}000} = 3.74$$

The efficiency of the pump being 60%, the actual horse power required will be 3.74 ÷ 60 = 6.2 h. p.

By the term suction head is meant the vertical distance from the level of the water supply to the center of the pump, to which is added friction loss in the suction pipe. By discharge head is meant the vertical distance from the center of the pump to the center of the discharge outlet, to which is added friction loss. By total head is meant the sum of suction lift, discharge head and friction loss in both suction and discharge pipes.

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*General Sales Manager, T. L. Smith Co., Chicago, Ill.

Friction is the most important factor to be taken into consideration when figuring pump requirements. Friction tables of water in wrought and cast iron pipes are included in the catalog issued by the T. L. Smith Co., Chicago, Ill., entitled "Never Failing Water," from which the accompanying illustration was taken. That the consideration of friction in pipes of various sizes is important is seen in the fact that 500 gal. of water delivered per minute through a 4-in. pipe means a friction head of 170.53 ft. for every 1,000 ft. of pipe, whereas the same quantity delivered through an 8-in. pipe produces a friction head of but 5.64 ft. per 1,000 ft. of pipe.

In the selection of a pump on a new job it is well to go at the matter systematically. The first thing to do is to determine the amount of water desired to be delivered on the job. In the selection of pipe for the work, the total head should be the least possible. The right size of pipe is determined by figuring the total heads of several sizes of pipe.

The Development of Warrenite-Bitulithic Pavement Reviewed by George C. Warren

An historical outline of the development of bitulithic and Warrenite pavements was presented in an address made by George C. Warren, President of Warren Brothers Company, Boston, Mass., before the highway engineering class of Valparaiso University, May 14, 1920.

Voids and the invention of the truncated cone for the testing of voids in the mineral aggregate by Schutte and the design of the stationary and portable plants by Horace W. Ash to produce desired pavements, were touched upon by the speaker. The conservation of old macadam roads and the use of gravel aggregate were also considered.

Experiments have been made on the use of asbestos in pavement, but because of post-war conditions the general introduction of this surfacing has been deferred, according to Mr. Warren.

The idea which led to the development of the new type of pavement which was subsequently called Warrenite-Bitulithic, was that better and more durable bituminous pavements than those in use could be produced by the scientific grading of comparatively coarse grain mineral aggregate combined with high grade asphaltic materials. The principle of the grading of the aggregate was in the inventor's mind from the first. By combining particles of aggregate, ranging from the largest to impalpable powder, in such proportions that each preceding size of agregrate is sufficient in quantity to fill the voids between the coarser stones, a road material is formed practically as voidless and dense as solid stone. In the course of experiments it was found that grains of material of uniform size contain the same percentage of voids, these voids being approximately 50% of the bulk of the compressed aggregate. Thus, a block of stone broken up would produce a surface area and a bulk double that of solid rock.

In the laying of Warrenite-Bitulithic, Mr. Warren explained, a bituminous concrete mixture consisting of relatively large and coarse particles of mineral aggregate which have been impregnated with bituminous cement is laid upon the foundation. Upon this is placed a thin layer of bituminous mixture containing fine mineral aggregate. These two layers are thoroughly compacted together by rolling, and the fine mixture is forced into the interstices between the larger particles in the lower course. Rolling is continued until no further compaction can be effected. The wearing surface of the roadway consists of a lower part of bituminous mixture with large, medium and small aggregate and an upper part formed by fine particles bonded with bituminous material.

New Solid Truck Tire

A new single solid tire for heavy duty trucks has been announced by the United States Tire Company. Because of its design this tire is said to eliminate the chief cause of internal friction and to provide for the dissipation of frictional heat. The tire is made in sizes from 7 to 14 in. and is known as the Monotwin.

National Pavements

A booklet on National pavements, containing 36 pages, 9x12 in., has been issued by the National Pavements Incorporated, New York City. Surfaces of bituminous materials are discussed and the principle of National pavement explained. About 80% of this pavement is finely pulverized earth from which all moisture has been eliminated before adding bituminous material, which constitutes the balance percentage of the pavement. Thus the earth is in its final state of division and a total absence of voids results, the pavement deriving therefrom certain valuable properties, as non-skidding surface, uniform density and consequent resistance to destructive stresses, and a firm, malleable, resilient mass. Microphotographs showing comparative sizes of aggregate in National and other pavements and illustrations showing highways constructed of National pavement are also included in the booklet.

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The Wisconsin Highway Commission will construct 136 bridges of various sizes during 1920, at an estimated cost of $750,000.

The Missouri State Highway Department has let contracts for over 200 mi. of federal and state aid roads so far this year. In addition to this amount of projects, more than 800 mi. of proposed federal aid work has been approved and is being let.

MEETINGS

Calendar of Coming Meetings

June 16-18.—North Carolina Good Roads Association—Annual Convention, Asheville, N. C. Acting Secretary, Miss H. M. Berry, Chapel Hill, N. C.

The date of the meeting of the Texas Road Builders' Association has been changed from June 16 and 17 to June 23 and 24.

PUBLICATIONS

MOTOR GUIDE BOOK, IN AND ABOUT MADISON, WISCONSIN, 4x9 in. 40 pages and covers. Illustrations and maps.

Information useful to the motorist about Madison and vicinity is given in this booklet, together with a map insert of the city and maps showing tours to nearby cities and other points of interest. An interesting feature of Madison brought out in this book is that the city has erected blue guide signs to mark the entire route of a tour of the city. By following these signs the motorist can see all placesof interest in the city with little difficulty.

MINNESOTA, REPORT OF THE COMMISSIONER OF HIGHWAYS. 1918 and 1919. Paper, 6x9 in., 48 pages and covers.

This report comprises tables showing the road building activities of the state during the two years covered by the report. In 1918 there were 1,211 mi. of grading and 463 mi. of graveling completed on state roads and in 1919 there were 1,053 mi. of grading, 722 mi. of gravel surfacing and 25 mi. of paving completed. During this period 265 bridges on state roads and 232 bridges on town and country roads were constructed, for which plans and supervision were furnished by the State Highway Department.

FACTS AND FIGURES OF THE AUTOMOBILE INDUSTRY. Paper, 6x9 in., 96 pages and covers. Charts and maps.

This booklet is published annually and comprises statistics concerning the motor vehicle for the preceding year. In addition, several graphic charts and illustrations are included to emphasize the most significant facts. Noteworthy among these is one which brings out the fact that the gross sales of motor vehicles, exclusive of parts and accessories, amount to a total value which is nearly double that of the gross sales of breadstuffs. A list of the officers and members of the National Automobile Chamber of Commerce, compiler of this publication, are also included.

CITY OF CINCINNATI DEPARTMENT OF STREET, SEWER AND CATCH BASIN CLEANING. Annual Report, 1919. Paper, 6x9 in., 28 pages and covers.

This report consists of a brief review of the operations of the department for the year, followed by a number of tables in which appear financial and operating cost statistics. Among the recommendations for the department set forth in this report are the installation of a fleet of automobile flushers and the use of the tractor trailer system in ash and garbage collection.

PERSONAL MENTION

A. W. Verharen has been appointed city engineer of Helena, Mont.

V. D. Johnson has been appointed engineer in charge of street construction, Roanoke, Va.

J. M. Walmsley has been appointed road superintendent for Montgomery County, Pennsylvania.

J. C. Meacham has been appointed engineer of road construction in Clay District, Marshall County, West Virginia.

George J. Boutelle has been elected city engineer of Chester, Pa., for a four-year term, succeeding B. G. Ladomus.

Frank Wallace has been appointed resident engineer, at the Missoula, Mont., office of the U. S. Bureau of Public Roads.

John B. Wright, formerly consulting highway engineer of Keene, N. H., has been appointed municipal manager of Springfield, Vt.

F. L. Ford, formerly City Engineer of Hartford, Conn., is now general manager of the Connecticut National Pavements, Inc.

A. R. Scott has resigned as engineer of Spokane County, Washington, and is now engaged in work in the old fields at Roundup, Mont.

Edward M. Milligan has resigned as assistant city engineer of Youngstown, O., and has accepted a position with the International Steel Tube Co. of that city.

Van E. Lawyer has resigned as county engineer of Schoharie County, New York, to become district supervisor in the New York State Highway Department.

J. H. Riddle, since 1916 connected with the Parkersburg, W. Va., office of the Portland Cement Association, has been appointed district engineer in charge of that office. Mr. Riddle succeeds J. W. Johnston, who has been transferred to the Milwaukee office.

G. F. Barstow, formerly in charge of road construction in Clay County, Minnesota, is now location engineer of St. Louis County, Minnesota.

A. M. Custance, for the past five years resident engineer for the Massachusetts State Highway Commission, has been appointed superintendent of water, streets and sewers of Hudson, Mass.

A. H. Fuller, for 18 years dean of engineering at the University of Washington and at present director of engineering at Lafayette College, has been appointed head of the civil engineering department of Iowa State College.

C. K. Kyle has been appointed comptroller of the Pennsylvania State Highway Department, succeeding William R. Main, resigned. Mr. Kyle was connected with the accounting department of the Pennsylvania Railroad for 18 years prior to his connection with the Pennsylvania State Highway Department.

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The War's Development of Motor Transportation

(Concluded from page 294)

volume of less-than-carload freight. In analyzing the conditions surrounding this class of freight movement we are brought closely to the fact that railroad operation is not the complete solution of the problem.

In the first place it seems to be quite generally conceded that this class of traffic is unprofitable to handle. On this subject, Edward Hungerford says in a recent number of the "Saturday Evening Post."

"Old time railroaders for years past have said that a freight car did not begin to make money until it had hauled its goods at least 40 mi.; today the modern generation of operators will come nearer to putting this figure at 80 mi. Up to a distance somewhere between these figures—and undoubtedly far nearer 80 than 40—the vast terminal charges of the American railroad nullify the profit of the haul itself. This is a principle of rail transportation so well understood by all competent authorities today as to be open to no dispute whatever."

Mr. Hungerford's statement is substantiated in a brief recently submitted to the Supreme Court in the Minnesota Rate Case, which says in part:

"The terminal cost of handling l. c. l. freight in 1916 was slightly less than 5 ct. per hundred pounds at each terminal, or double that amount for two terminals. Since 1916 this cost has increased more than 100% and in 1919 the cost of handling freight at 15 stations in Central Freight Association territory, ranging in size from Cincinnati to a town of 100 inhabitants, destined to three large stations in Trunk Line territory, was 22 ct. per hundred pounds. This means that at the present rate of 25 ct., first class, 5 mi., per hundred pounds, it is necessary to haul the average l. c. l. tonnage 40 mi. to break even on 80% of the actual costs, leaving nothing whatever for profit, taxes or interest on investment."

In the face of the distribution of traffic by commodity classification this fact is very interesting, as it is the crux of the whole transportation problem which has developed with the growth of our industries and population.

Let us examine it briefly for the moment. Under the classification of low rate freight are certain products of agriculture, the products of mines, animals and forests. Uner the classification of high rate freight appear the products of manufacturing, merchandising and miscellaneous shipments. Low rate freight is moved for average distances of from 133 to 335 mi., while the average haul for all traffic is about 167 mi., and in the Eastern District, only 138 mi. As the low rate freight represents 77% of the total traffic, it is quite apparent that the high rate freight movement must be largely confined to distances closely approaching the limits of profitable haulage mentioned in Mr. Hungerford's article.

To sum up the whole proposition which the development of transportation in this country and its effect upon the prosperity of the people present, it is quite obvious that we have been approaching a time when our future progress will demand a new and better expansion in transportation which can adapt itself to changing conditions and which is in large measure unrestricted in its direction of operation. This expansion will be found in the general adoption of motor truck transportation within the zone of its economical operation. This appears to be a logical step in the direction of improvement and its application destroys nothing which progress has constructed but rather increases the efficiency of these institutions. The motor truck is only a profitable competitor of the railroad for limited distances of haul, depending on the class of commodity handled, and will do much toward relieving them of unprofitable and hence undesirable business.

In the development of motor truck transportation there is one factor which requires particular consideration, that is, the extension and improvement of highways. Without this the economic value of the motor truck cannot be fully realized. Poor roads mean stagnation in this direction, for the reason that it takes anywhere from two to ten times the energy to move a given load over bad roads as it does over good. This applies whether the motive power be from a gasoline engine or a horse. Consequently the expansion of transportation by motor truck operation as a contributing influence to the progress of our civilization includes in its conception the construction of adequate roads over which trucks can economically operate, for it is quite obvious that the ramifications of railways cannot be expanded to the form of a series of spider's webs radiating from industrial centers and reaching all communities.

GOOD ROADS

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Dust Preventives & Road Binders

By PREVOST HUBBARD

Chief, Division of Road Materials Tests and Research, United States Office of Public Roads.
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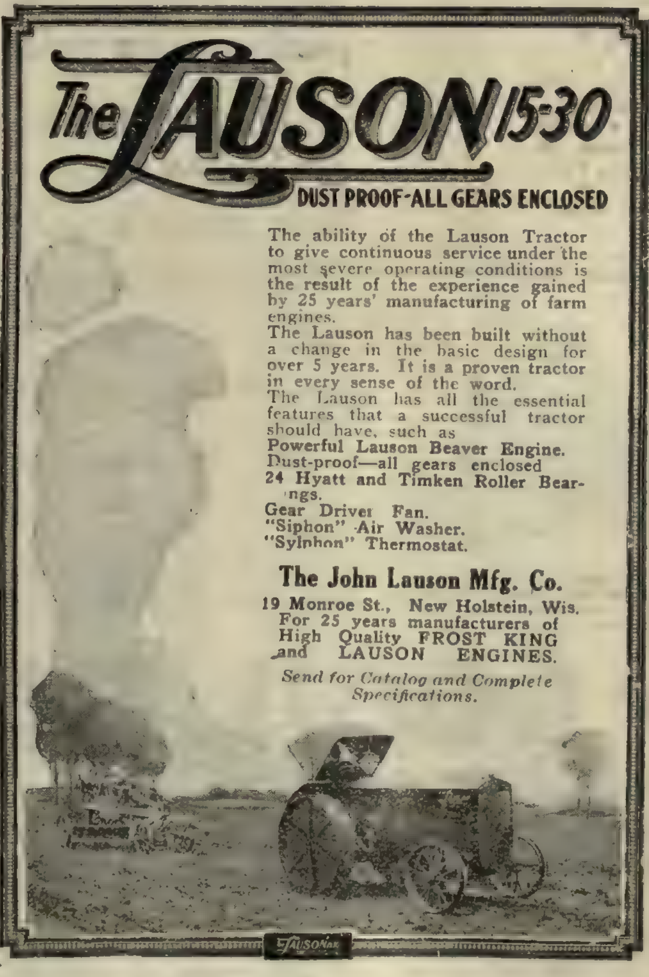

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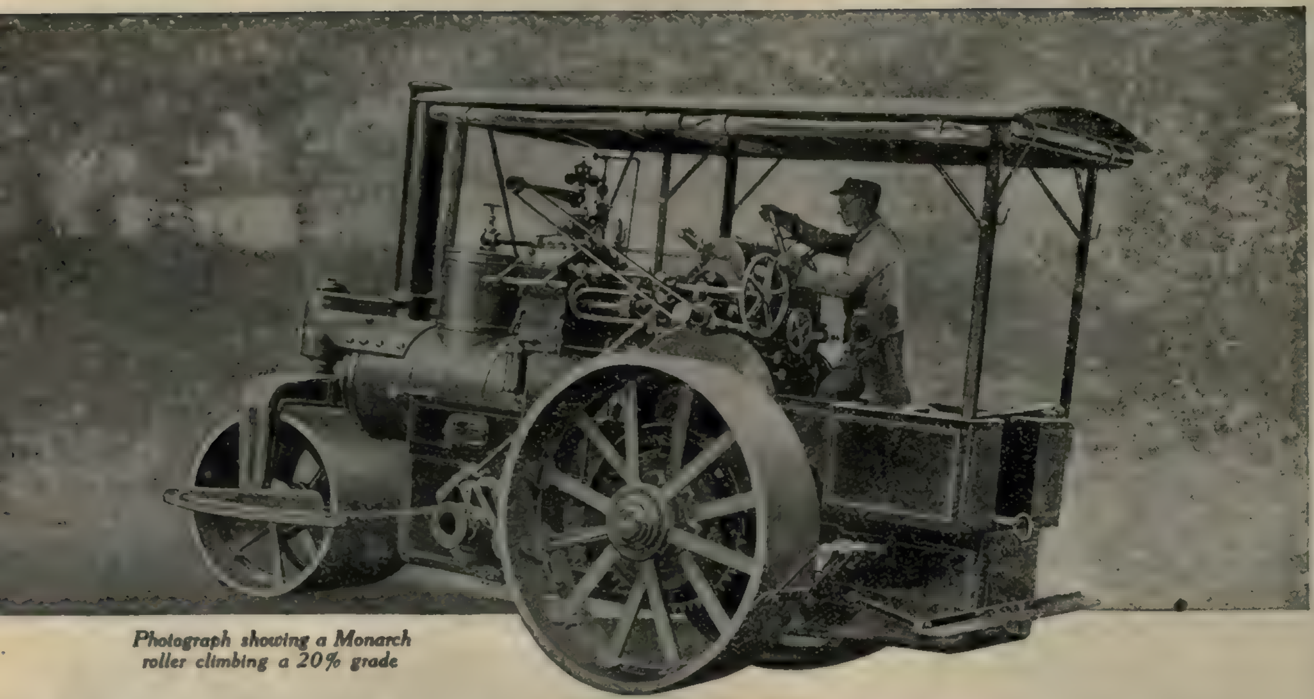

Photograph showing a Monarch roller climbing a 20% grade

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Old Series. Vol. LVIII
New Series, Vol. XVIV

JAMESTOWN, N. Y., JUNE 16, 1920

Number
24

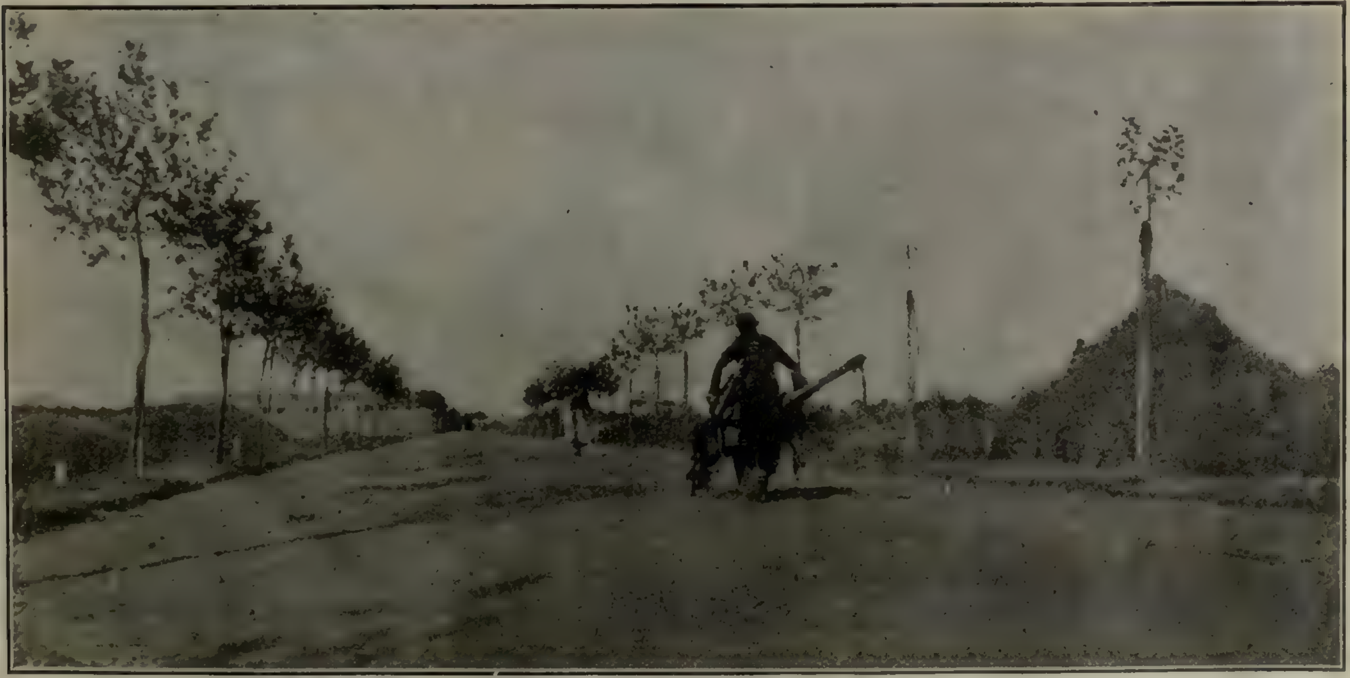
Road Building in the Chinese Republic

Old City Walls Being Utilized as Quarries for Road Building Material—Avoiding Numberless Graves One of the Chief Difficulties in Highway Construction

The mention of France brings up the idea of good roads, while China suggests to our minds the idea of walls and barriers. But with the advance of civilization the tendency is to eliminate all barriers, both natural and artificial. Progress demands communication rather than exclusion. China was the last country to appreciate this principle, opening her ports to commerce but a short time ago. Having taken up the modern spirit, China is busying herself with clearing away the physical remnants of an age of darkness and unenlightenment—she is tearing down her walls and building good roads from the stone and brick. Thus this nation with 300,000,000 people takes the first step to catch up with others.

The walls of the city of Tientsin were demolished 19 years ago by Yuan Shih Kai, and in the revolution which resulted in the overthrow of the Manchu dynasty, many Tartar cities with their walls were razed to the ground. The Tartar part of the city of Hangchow, called the Paris of China, was destroyed, but the wall separating the Chinese and Manchu quarters was left standing. Recently this inner wall has been torn down and macadam roads and streets have been constructed from the materials obtained from it.

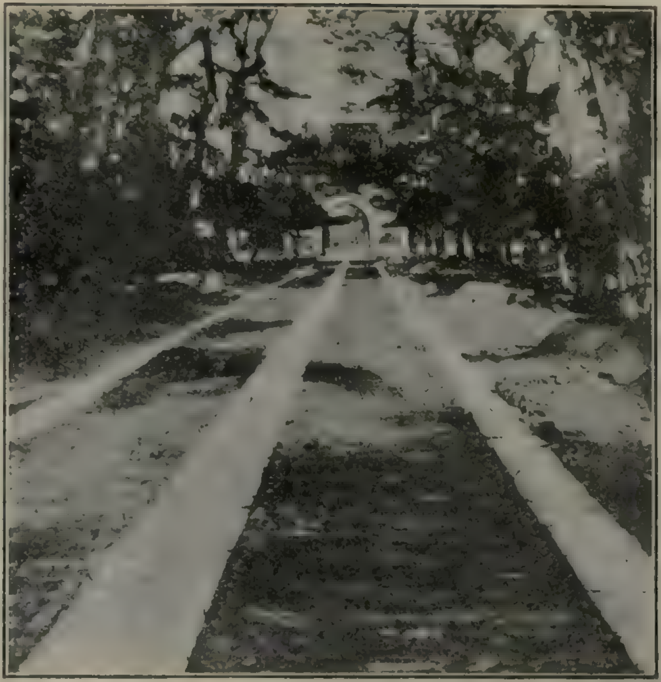
About a score of cities have taken up the movement to use the city walls as quarries for road materials and the brick, six times as large as those



A NEWLY OPENED ROAD BETWEEN SHANGHAI AND WOOSUNG—MOUND AT RIGHT IS A CHINESE GRAVE—ROAD IS 24 MILES IN LENGTH used in this country, and the squared stone also found in the walls, are serving the Chinese more advantageously than ever before. The city of Nanking, which had one of the longest city walls, has torn down the wall and made some fairly good streets. Even Canton has just finished pulling down her city walls and building city streets in her large suburbs, which are rapidly growing.

The picturesque narrow streets of Chinese cities are in many cases giving way to maloos or horse roads. Rickshaws supplanted the old sedan chairs, at the same time requiring more room to travel in. Horse or motor traffic is absolutely impossible in many of the main streets of the cities of China and the commercial life is hampered. The city of Hangchow issued an edict for the purpose of widening the streets which required that all new buildings must be erected several feet back of the existing line. In many sections of the city where old and new buildings alternate, a curious cogged effect is produced.

"Road building is one of the hardest jobs ahead of China," says Everard Thompson, well known in America as the builder of the Yale Bowl and Sheepshead Bay Speedway and who is now representing the Firestone Tire & Rubber Co., in the Far East. "In much of the coastal strip of that republic it is next to impossible to get stone for the foundation and top dressing of roads. For hundreds of miles the traveler encounters nothing but flat, alluvial plains where no rocks are obtainable and not even pebbles big enough to throw at a 'wonk dog.'



VIEW ON AN ANCIENT MANCHU ROAD IN NORTH CHINA—BRICKS IN PAVEMENT HAVE BEEN DOWN ABOUT 800 YEARS.

"Then, the spirits are a great nuisance. These probably cause more trouble to the road builder or developer of property near a large city than any other one thing. The Chinese worship the spirits of their ancestors, which in turn influence strongly the lives of the living Chinese relatives. Now it is one of the first principles of a Chinese spirit that it does not want to have its resting place disturbed and the burden of this desire is on the living descen-

A STREET SCENE IN SHANGHAI, THE BEST PAVED CITY IN THE ORIENT dants. Someone has said that Chinese graves occupy one-twentieth of the whole area of China. This percentage may be a bit too high but it is true that a Chinese landscape even in the best farming districts, resembles a bunker filled golf course. The Chinaman has apparently buried his dead in the fields wherever an opportunity presented itself. The graves are in no set order nor are they gathered into lots or cemeteries as in most countries.

"In burying their dead, the coffin is simply placed upon the ground in the open field and earth heaped over it until the mound reaches a height of about 5 ft. The grave is cone-shaped and some are as high as 15 ft., the height generally having a direct relation to the importance or wisdom or virtue of the departed. So numerous are these graves that they often touch at the base and cover miles of territory. They hamper farming very seriously.

"Thus the largest problem in road building is to get the right of way in a more or less straight line from point to point. Then comes the job of moving the graves, for it is impossible to get anywhere in a straight line for any distance in China without running into hundreds of graves. These graves do not come in the purchase or lease price of the land itself but each grave must be bargained for with the relatives, the ordinary price being about $100. All the living relatives have a say in the matter and the purchaser must reestablish the bones at some mutualy agreed place. Very often a dissatisfied relative will delay construction work by refusing to permit the grave to be moved.

"But notwithstanding the difficulties existing at the present time in the job of road building in China, the modern element in the Chinese race is awakening to the vast possibilities ahead of this richly endowed country.

Thus it is inevitable that better roads will one day become the slogan of a new China. When that time comes China will make use of her untold wealth and take her place as one of the most powerful nations of the world."

The Federal Government's Part in the Country's Highway Program*

By ROY D. CHAPIN†

In discussing the highway problems of our Government today, I want to take you back to 20 years ago and have you remember road conditions at that time. Generally speaking, the highway simply led from the town into the country. The motor vehicle was hardly heard of and when you set out with a horse your radius of action was usually limited to 20 mi. a day. The average trip over the rural road probably was not more than 4 or 5 mi.

Today you step into your motor car and your radius of travel is limited only by the condition of the road. It is easy to cover from 150 to 200 mi. a day over a good road. Motor trucks make regular runs between points 100 to 125 mi. apart.

It is my purpose to show you that the 2,500,000 mi. of American highway have suddenly become a most important link in the whole country's transportation system. The present heavy traffic over our roads, both passenger and freight, was not anticipated by any of us ten years ago. Who can predict today with any accuracy what that traffic will be in 1930?

Transportation is a fundamental basis of our civilization. We must help mold this new and wonderful vehicle of transportation and the roadbed over which it moves so that we secure maximum benefits for ourselves and our children.

Our Government has embarked on the expenditure of hundreds of millions of dollars for highways. No longer are these expenditures a question of engineering or construction only. They have become one of our great economic problems, tied up intimately with our whole means of transportation, and none of you but will agree, with our recent railroad experiences, that we need every increase possible in our means for moving freight and passengers. Center your thought on the fact that highways and highway transport are economic problems, and henceforth we must deal with them on this basis. A road is of no value, however well built, unless it is used. Therefore, unless we promptly organize our federal administration of highways to secure maximum returns, not only will we be lacking in the transportation demanded in the near future, but we will waste so many of these millions on inadequate roads that it will be difficult to secure further construction funds.

The era of great railroad expansion is over. Highways and highway transportation hold the center of the stage. Let us organize for the future just as we would organize any big business, with ample power and deep appreciation of the economic problems involved. The times call for new methods and new plans, for the war has changed the entire future of our highways.

Under the present federal aid law, the Government administers its appropriations through a subordinate division of the Department of Agriculture. The powers granted are few, and as those of you with experience at Washington know, it is impossible for any subordinate division of a department to efficiently administer as great a highway development as we suddenly find before us. This is no criticism of the Secretary of Agriculture or the personnel of the Bureau of Public Roads. They are limited by the law. Highways were placed under the jurisdiction of the Department of Agriculture when our roads simply led from farm to market. No subdivision of any department can give the attention to this subject that it deserves. The time has now come when an independent branch of the Government should be set up whose sole duty it is to take over present governmental highway activities, centralize them, and administer them with a true vision of the future of highway transportation.

---

*Paper presented at the eighth annual meeting of the Chamber of Commerce of the United States of America, Atlantic City, N. J., Apr. 27-29, 1920.

†President, Hudson Motor Car Co.; Chairman, Highways Committee, National Automobile Chamber of Commerce.

Therefore, let us ask Congress to provide for the future before it is too late. Exhaustive study has indicated that a commission composed of representatives of the various geographical sections of the country and clothed with adequate authority can furnish the administration required. It can do more than this. Unhampered by departmental restrictions and with a broad enough personnel to be truly representative of each section, it can not only demonstrate to the nation the types of road that should be built and that will last under the new traffic, but it can analyze this new traffic and help direct it so that it may attain its maximum efficiency as the great new link in our country's transportation system.

During and since the war, the limitations of the Bureau of Public Roads have been most apparent. In spite of the excellent organization now in charge of that office, its location under a governmental department will never permit our American highways to fulfill their destiny. Move this organization bodily, if you please, and with the addition of the membership of a federal highway commission, give these men full scope to treat with highways and highway transportation on the basis of a sound business organization, reporting annually to Congress and the country on this subject alone. You would not be content to see the railroad problems of the country administered under the Post Office Department or be made a subordinate administration of any other department. Therefore, we must realize the urgent need of quick action in securing an administration that will be sufficiently effective to cope with these extraordinary developments and will protect us as well from the waste of hundreds of millions in inappropriate types of highways to the entire discredit of our road building program.

Remember that the txapayer will only continue to vote appropriations and pay taxes for highways if he is convinced that he is getting value received. Is the Government getting value received for its present highway appropriations? Emphatically, no! The feeling prevails in Congress that federal funds must
produce national results. Federal taxes are paid on
for this purpose. The present federal aid law cal
for a dollar expended by each state on roads for ea
dollar given to that state by the Government. T
law does not restrict these expenditures to nation
highways, and what is the result? In some states t
federal funds are appropriated pro rata to the cou
ties In but few states has federal aid resulted in
true system of state highways, and these state hig
wayqs are only intrastate in character since th
rarely have been connected with the main highwa
of other states. Are these roads of benefit to inte
state commerce, to the general welfare, or to t
common defense, the criterion from which most go
ernmental expenditures must be analyzed? In is
lated cases the answer is, yes. In the main, feder
funds have been given to roads which do not proper
comprise a federal system and a heavy portion
the expenditures so far has gone into roads th
will need to be rebuilt almost immediately, or ha
already been rebuilt.

What should be done is to permit the federal, stat
and county governments to select those roads
most importance from their own standpoint and
each improve and maintain those roads so selecte
We should have national highways built from feder
funds. This will release state funds for state co
struction and county funds for county constructio
Appropriations will not be scattered haphazard
under the present system. This federal policy wou
insure maintenance and would not permit anythi
but a durable road. Certainly, no effort would
made to take all or any part of the work away fro
the state highway department save that of locatio
as long as the state highway department is efficie

Here we have a system similar to that of Franc
where, until the war came, practically every road a
byway was passable 365 days of the year and carri
the traffic at a minimum of cost.

Outside of construction, we must never overlo
the point of maintenance, which in most states h
just come to be regarded as of equal importance wi
construction.

Our present federal aid law distributes feder
funds to 48 separate state highway departments, b
specifically says that Government funds are to
expended only for construction purposes. You w
hardly call this sound economics.

Returning to my statement that the Governme
should construct and maintain roads of intersta
importance, the best definition which I have seen
these roads as well as the best expression of t
entire situation, from a standpoint of national polic
is written into the bill introduced in Congress by t
Hon. Charles E. Townsend, Chairman of the Sena
Committee on Post Offices and Post Roads.

Mr. Townsend would provide for a federal highw
commission and for construction and maintenance

(Continued on page 309)

GOOD ROADS
CONSTRUCTION TRANSPORTATION MAINTENANCE

Founded January, 1892

E. L. POWERS
Editor

T. A. HULBERT
Managing Editor

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JAMESTOWN, N. Y.

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Copy for classified and other advertisements where proofs are not required will be accepted until noon on Monday of the week of issue.

Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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Vol. XVIV JUNE 16, 1920 No. 24

DISTRIBUTION THE GREAT NEED OF THE COUNTRY

In the course of an address upon the influence of tractor and trailer traffic upon the design of highways, the full text of which is printed elsewhere in this issue, H. E. Breed, a consulting highway engineer who was formerly first deputy commissioner in the New York State Department of Highways, said:

"The crux of the economic situation, as I see it, in this country today is, even more than production, distribution—distribution of the products of the soil, of labor, of machines; and fairer distribution of the wealth that accrues from these products."

Though this contention is not new, it emphasizes a point that has been made repeatedly in this column in urging that there be no curtailment of the country's road building program.

Distribution is one of the greatest needs of the country today. There are three agencies of distribution—the waterways, the railways and the highways. The first are of only very limited capacity. The second are inadequate. Neither can be depended upon to increase greatly in capacity in the near future. The highways, therefore, must be developed to meet the emergency, for their capacity can be expanded in less time and at less cost than can that of either of the other two facilities.

These are the chief reasons why curtailing road work is a fallacious economic policy at present. Distribution is the great need of agriculture and industry. Roads are the logical facilities of distribution. There is every reason to build them.

THE FEDERAL GOVERNMENT AND HIGHWAY TRANSPORTATION

There is much food for thought in the article on "The Federal Government's Part in the Country's Highway Program," by R. D. Chapin, which is printed on other pages of this issue. And with most of Mr. Chapin's contentions road builders and those concerned with highway transportation will find themselves in complete accord, we believe.

His criticism of the present governmental organization for administering federal aid will appeal to all who have given the matter any attention. Through no fault of the Secretary of Agriculture or of the personnel of the Bureau of Public Roads, that bureau lacks power, facilities and funds to render the service that it might well undertake. In these days, road building is a too important activity to be handled by a subordinate bureau of any department.

Mr. Chapin believes that the Townsend bill provides the logical remedy for the present defects. As is well known, this measure calls for the appointment of a federal highway commission to have charge of the building and upkeep of a national highway system consisting of two main highways in each state, these two roads not to exceed 1% of the mileage of highways in a state except where a greater mileage is necessary in order to provide suitable connections with main roads in adjoining states.

Of course, it is possible to pick flaws in the Townsend bill; it would be possible to find fault with any similar measure. Probably the actual location of the two roads in each state would be the most troublesome feature of the law in its practical application. But amendments are always possible, and the bill as it stands would provide for a start on a more businesslike administration of federal road work.

ROADS IN CHINA AND JAPAN

China and Japan are both waking up to the advantages of good roads, according to articles printed on other pages of this issue. What this means, and will mean, to the progress of these countries is probably hardly realized even by those who are familiar with conditions.

It isn't true, of course, to say that a country can be measured by its roads. But it is true that a nation's attitude towards the road question is indicative of its progressiveness, or lack of progressiveness. And it is growing more so every day, as the highway increases in importance as a unit of what so frequently has been called "the trinity of transportation."

Both China and Japan have a long way to go in some directions before they can take their places alongside the western nations. Good roads will do much to hasten their progress.

Urges Increase of Federal Aid Allotment To $30,000 per Mile

Frederick S. Greene, New York State Commissioner of Highways, recently appeared before the House Committee on Roads in Washington to urge the passage of the Wadsworth-Hicks bill raising the Government allotment on federal aid roads from $20,000 to $30,000 per mile. Leslie A. Gillett, Chief Engineer of the New Mexico State Highway Commission, P. St. J. Wilson, Chief Engineer of the U. S. Bureau of Public Roads, Representative Frederick C. Hicks of New York and Commissioner Greene made the principal arguments for the bill.

Road Laborers in Boyle County, Kentucky, Strike for Shorter Hours

Work on the state aid road between Perryville and Springfield, Ky., was delayed recently because twelve laborers went on a strike for shorter hours. They had been working ten hours a day for $3.00 and put in demands that they be required to work only nine hours at the same wage. The men quit and delayed the work until other men were secured to take their places.

There are at present about 120 men working on the highways in Boyle County. Their wages were increased to $3.00 per day several weeks ago.

Pittsburgh Sells $3,000,000 Highway Bonds

Raises Interest Rate to 5% on $7,281,000 Improvement Bonds and Receives One Bid For Less Than Half Amount Bonds Offered

The $7,281,000 worth of bonds which were offered for sale on April 8 by the City of Pittsburgh, Pa., were again offered on May 19, with an interest rate increased from 4½ to 5%.

But one bid was received, a syndicate formed by the Union Trust Co., of Pittsburgh, and the Guaranty Trust Co., of New York City, offering par and accrued interest for $2,901,000 worth of bonds issued for the widening Second Ave. and Ferry St. and for the construction of the Boulevard of the Allies. The remaidner of the bonds, amounting to $4,380,000 for which no bids were received, will be withdrawn from the market until financial conditions improve.

Bid Prices on Highway Work

Unit Prices from Bids Received by Various State Highway Departments

During the month of April the Nebraska Depa ment of Public Works sent letters to the highw departments of all the states requesting prices construction work prevailing at that time. Th information is tabulated in the May report of t department, as follows:

COLORADO

18-in. corrugated pipe	$ .285-$1.35 per cu. yd.
Concrete paving	2.59 - 3.17 per sq. yd.
Earth excavation	3.75 to 4.10 per ft. in place

ILLINOIS

Earth excavation	$ .80 per cu. yd.
Concrete (excluding cement)	1.80 per sq. yd.
Brick on concrete base (excluding cement)	3.39 per sq. yd.

INDIANA

Earth excavation	$ .94 per cu. yd.
Concrete pavement (6-8 in., 18 ft. wide)	1.85 per sq. yd.
Brick on 4-in. concrete base	3.92 per sq. yd.
Bituminous concrete	3.70 per sq. yd.

(Approaches a sheet asphalt and laid with 1½-in. top course on a 1-in. binder course with 6-in. base.)

IOWA

Earth excavation (straight grading)	$ .66 per cu. yd.
Earth excavation (for paving)	1.10 per cu. yd.
Concrete paving	4.06 per sq. yd.
Brick paving	5.62 per sq. yd.
18-in. concrete pipe	1.72 per lin. ft.
18-in. corrugated pipe	1.72 per lin. ft.

MICHIGAN

Earth excavation	$ .70-1.00 per cu. yd.
Concrete paving	2.70-3.80 per sq. yd.
(No bids awarded in excess of $3.05 per sq. yd.)	
Bituminous concrete	3.60-3.90 per sq. yd.

MISSOURI

Earth excavation	$ .55
Concrete (8-in. depth, 1 course)	2.75

NEVADA

Earth excavation	$ .75 per cu. yd.
Concrete	1.00 per sq. yd.
18-in. concrete pipe (in place)	3.50 per lin. ft.

NEW HAMPSHIRE

Earth excavation	$1.25 to $1.50 per cu. yd.
Asphalt concrete	.90 to 2.00 per cu. yd.
Corrugated pipe	1.80 per lin. ft.
Laying corrugated pipe	.50 to 1.00 lin. ft. pipe.

OHIO

Earth excavation (unclassified)	$ .648 per cu. yd.
Concrete pavement	2.73 per sq. yd.
Reinforced concrete pavement	3.02 per sq. yd.
Brick on concrete base	3.37 per sq. yd.

UTAH

Earth excavation	$ .75 per cu. yd.
Concrete	1.30 per sq. yd.

SOUTH DAKOTA

Earth excavation (highest in 1919)	$ .60
18-in. concrete pipe (in place)	3.50 per lin. ft.

VERMONT

Earth excavation	$1.00 to $1.50 per cu. yd.
Concrete (6 to 8 in. thick)	2.00 to 2.60 per sq. yd.

(Covers expenes of laying only and no other item of construction.)

VIRGINIA

Earth excavation	$ .80 per cu. yd.
Concrete	3.15 per sq. yd.
Sheet asphalt on 1:3:6 base	3.20 per sq. yd.
18-in corrugated pipe in place	2.50 per lin. ft.

Roads Solution of Japan's Transportation Problems

Samuel Hill Believes Building System of Good Highways Better than Changing Japanese Railroads to Standard Gauge

Samuel Hill, Honorary Life President of the Washington Good Roads Association and Past President and Director of the American Road Builder's Association, has returned to Japan and is again active in assisting the good roads movement in that country.

It is the opinion of Mr. Hill that it would be wiser for Japan to build a system of good highways than to change her railroad system to standard gauge, as has been proposed. The standardization of the railroads would cost $2,000,000,000, Mr. Hill estimates, an amount which could more profitably be used in the construction of highways, since motor trucks running on hard roads could transport commodities more quickly and economically than could the railroads.

THE MAIN STREET IN KOBE, JAPAN—A WATER-BOUND MACADAM PAVEMENT

Jefferson County, Alabama, Selects Asphalt for Roads

A body of seven men appointed by Jefferson County, Alabama, to carry out the extensive highway program of that county, has selected asphalt as the material to be used in the work. This committee is known as the Road Advisory Committee and is composed of three men of technical education and four men with business and financial interests.

Jefferson County has let already $2,000,000 worth of road work, all of which is of asphaltic construction. The county recently voted a bond issue of $7,000,000 for the improvement of its highways and so far has let contracts calling for two types of asphaltic construction: asphaltic concrete using a Topeka mix, with 2-in. wearing surface and sheet asphalt with a 5 to 7-in. base, 1½-in. binder and 1½-in. wearing surface.

Bureau of Public Roads Proceeding with Study of Soils

District Engineers Will Study Fully the Physical Conditions Existing at Places Of Road Failures and Send Large Samples Of Soils to Washington in United Effort To Determine the Bearing Power of Soils

The U. S. Bureau of Public Roads is going forward with its investigation of the load bearing values of soils as announced in the May 12, 1920, issue of GOOD ROADS, and Thomas, H. MacDonald, Chief of the Bureau, has issued instructions to the district engineers throughout the country as to the manner of carrying out this important investigation. Failures of road structures will be studied and data of all physical conditions obtaining at the points of failure will be collected, including photographic records. Sample bags to hold 1 cu. ft. of soil are provided the district engineers and, when filled with soils to be examined, they will be sent to the central office of the Bureau of Public Roads for examination.

The communication from Mr. MacDonald to the district engineers is as follows:

"It would seem to me to be very desirable, in view of our enormous road building program, that every effort possible be made immediately to obtain accurate scientific information regarding the characteristics of soils which render them of high or low bearing value, as the case may be.

"The Division of Tests at Washington has begun an investigation in the vicinity of Washington with this idea in view, but little can be accomplished along this line unless a nation-wide research be made, obtaining the services of various cooperating agencies. The problem of eliminating road failures due to poor foundations seems to be possible of solution in one of the following ways:

"(1) Make the road surface thick enough so that the pressure will be sufficiently distributed to the underlying subgrade, or so that the surface, because of its inertia, may absorb a considerable amount of the shock of traffic, or

"(2) Design the slab to have sufficient strength to bridge over the soft subgrade, or

"(3) Improve our drainage systems to exclude the moisture in dangerous amounts from soils which are rendered of very low bearing value by the presence of water.

"It is perhaps true that all soils have adequate bearing value when the amount of water in them is kept to a sufficiently low percentage, or it may be possible that certain soils will be susceptible of treatment which will render them of higher bearing value than they have in their natural state. It is obvious that if we are to advance our ideas regarding road construction we must begin with the road foundation and must gain accurate information as to what properties of soils make them good or poor soils for foundation purposes. With this knowledge in hand, we will then be in a better position to say how the road should be designed when it is to be laid on these particular soils, or, possibly, how we should treat the soil when its characteristics are known in order to increase its bearing value.

"With the idea in mind of gaining this preliminary information, I should like to have you obtain the cooperation of the various state highway departments in your district in an investigation of soil conidtions existing where failures due obviously to poor soil conditions have occurred in the roads. I would suggest that you designate someone in your district to make an inspection of a number of road failures due to poor subgrades, whether due to poor drainage or to peculiar soil conditions, working in cooperation with the state highway departments and also, wherever possible, with the state geologists.

"In this inspection samples of 1 cu. ft. each should be taken from the subgrade, preferably directly under the failure; photographs should be taken of the site of failure; and complete information should be given regarding the topography, preferably in the form of cross-sections and profile of the road in the vicinity of the failure. Notes should be taken regarding the character of the failure, the approximate amount of traffic, drainage conditions, the probable presence of water bearing strata, or other conditions that may make for the wet condition of the subgrade. It is particularly important that data be given tending to show how water reached the subgrade, whether by vertical capillarity, horizontal capillarity, through seepage strata, from the surface, etc. An auger 1½ in. in diameter will be useful to explore the underlying subgrade and much useful information may be obtained by noting the texture and condition of moisture of the soil at different depths. Thus, if the soil at the surface is wet, and is very compact, dense and dry below, the probability is that the water entered the subgrade from the surface and was prevented from escaping by the underlying impervious layer. If the underlying layer of a wet subgrade is wet and porous and it, in turn, is underlain with compact impervious clay which is dry, it would seem that the porous layer is a seepage stratum through which water is flowing and is rising to the top of the subgrade by vertical capillarity. A number of combinations of conditions are to be expected and must be carefully studied to determine how the water which existed in the subgrade at the time of failure arrived there.

"Similar samples and observations should be taken from spots in the same road which have not failed. The samples so taken should be sent to the Bureau headquarters at Washington, where they will be subjected to suitable tests. Bags of 1 cu. ft. capacity are being sent to you for use in this investigation. If the texture changes down to a depth of 5 or 6 ft., as determined with the auger, take a one-quart sample and place in small white cloth bag provided for this purpose.

"This preliminary investigation need not be very extensive so far as the number of samples is concerned. If samples are secured from 15 bad failures in each district, together with 5 samples from parts of the same roads which did not fail, these samples will serve the purpose of this preliminary investigation.

"I shall appreciate it if you will have this investigation begun immediately. I am enclosing herewith a number of blank forms which should be used by the engineer assigned in your district to this work. I am also sending under separate cover 20 sample bags and tag envelopes to be used for shipping the samples to Washington. It is suggested that when selecting the failures, differences in the soil characteristics as wide as possible be sought and that failures on fills as well as in cuts be investigated."

Change of Texas Bond Law Urged

Would Raise Interest Rate on Road Bonds From 5½% to 6% and Exempt Municipal Bonds From Taxes to Stimulate Buying

The changing of the interest rate on Texas highway bonds from 5½ to 6% is being urged by a number of county officials and others in that state interested in the construction of good roads.

The present law limits the rate of interest to 5½%, which is a less interest rate than that of many other desirable securities. Many millions of dollars of road bonds have been voted in Texas, and since the state laws require that the bonds must not be sold for less than par and accrued interest, some bond issues are being sold with difficulty. It is reported that some bids on bonds for road work have been considerably below par.

Besides the increase of the rate of interest of highway bonds, it urged by many in Texas that a law be enacted to exempt municipal bonds from taxation in that state so as to encourage Texas buyers to purchase them.

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Lackawanna County, Pennsylvania, has voted an issue of $1,000,000 highway bonds.

HIGHWAY TRANSPORTATION

Rates for Cross Country Trucking*

By THORNE BROWN†

When Professor Mickey suggested an opportunity to discuss before your convention the question of freight rates in automobile service, I agreed with some glee to undertake the task. I knew full well that I had very little information on the subject, but I went on the assumption that no one else knew very much about it, and that if I used words enough to cover a few thoughts I might be able to get away with it.

With your permission, I shall qualify as a good roads expert. I have acquired an intimate knowledge on the subject by attempting to guide an automobile thousands of miles between ditch and ridgepole and wondering always while performing this tight rope feat why the ditch should be so deep and why the ridge should be so high.

The Nebraska State Railway Commission undertook about a year ago to do something which it thought would be a benefit to the development of cross-country trucking. It made careful studies and promulgated a rate structure which it promulgated in an order directed to all who do trucking as a business with the general public.

This action came about in this wise. The National Council of Defense was much interested in the question of freight trucking. The railroads of the country were unduly burdened and were unable to handle the traffic properly. Development in equipment was stagnant because all energies were directed to war work. It was felt that relief for railroad burdens might well come from the use of gasoline-driven vehicles. The Nebraska Commission was asked to consider the advisability of promulgating a set of rates which would standardize the business and prevent so many failures and bankruptcies as were regularly occurring. It undertook the task.

Material was gathered from ever source possible in the consideration of cost of operation and volume of business. A hearing was called at Omaha, Nebraska, and all truckers engaged in cross-country hauling were invited to be present and discuss the problems which they had developed. This hearing emphasized the fact that almost all men who had put their money into a line of trucks and started out to develop that business had gone about it in the same manner as a man with soap in his eyes hunts for a towel. Some of them knew something about costs; some of them knew nothing on the subject. A very few had attempted to keep intelligent records. Most of those whose evidence was sought had kept no books at all.

It was evident to the commission that any action which it might take in the matter of standardizing trucking rates would have to be more or less an experiment, subject to such frequent changes as experience warranted. From the fragmentary evidence from a large number of sources it was determined that the gross cost per ton-mile of operating would be 25 ct. plus. This included ample allowance for depreciation, direct cost of operating, certain general expenses, such as office and soliciting business, and a return of 20% on the investment. This percentage was put high purposely to attract capital into the business. It was and is a highly experimental business so long as dirt roads are used, and a promise of a good reward was essential. The standardized rates were confined in the order to the eastern part of the state, because conditions in the western part of the state were so entirely different.

No real ideas existed among the truckmen as to classification of kinds of freight, and differing rates depending on such classification. On their recommendation, however, the commission adopted the first four classes used by railroad companies.

The truck men had been very unscientific in their method of assessing charges. Some carried all freight at the same rate per ton or mile, regardless of its bulk, its value, or its perishable nature. Others made the assessment on the weight per cubic foot. The rates fixed for the highest class of freight were 1.5 ct. per 100 lb. per mile plus a terminal charge for handling at each end of 15 ct. per 100 lb. This rate graded down as the commodities used fell within cheaper classes. A number of exceptions to these rates were made, the exceptions in fact, affecting more of the traffic than the schedule.

Much of the trucking to date has been a one-way business with an empty return haul. Separate consideration had to be given to this class of traffic and this was undertaken by exceptions to the regular rule.

Most important in the order was the effort to coordinate experience. The lack of experience tables was the most embarrassing feature in making an intelligent survey of the problem and reaching intelligent conclusions. The order provided that the common carrier trucking concerns should keep books embodying certain information and that annual reports were to be made to the commission summarizing the financial results of each trucking concern's business. From these financial reports it was hoped that the weaknesses in the commission's order could be discovered and such corrections be made as would insure on the one hand that the business remain on a profitable footing and on the other hand that the rate structure be such as would develop volume of business.

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*Paper presented at the Nebraska Road Institute, University of Nebraska, Lincoln, Mar. 1-5, 1920.

†State Railway Commissioner.

It was early determined that a mistake had been made in adopting the railroad classification. That classification contains about 10,000 different items. The average man in the trucking business was practically helpless in its use.

It was also determined in secondary hearings that the terminal handling cost was higher than at first thought. A new classification was prepared by the commission's experts for use in trucking alone. This classification has but two main classes in which freight falls and contains less than one hundred items. The terminal charge was raised from 15 ct. per 100 lb. to 20 ct. per 100 lb. Other exceptions were embodied for the purpose of encouraging certain peculiar and specific business which it was found was developing.

The outcome of the effort of the commission to standardize this business so as to produce a minimum of disaster and a maximum of efficiency is still in grave doubt. The commission is not sure that it has not illustrated the old adage, "Fools rush in where angels fear to tread." No question exists but what the cross-country trucking business falls within the constitutional provision which subjects such business to regulation by the state. The order of the commission was perfectly legal and violators of that order are liable to heavy penalties.

It is not, however, the purpose of the commission to apply this order rigidly and to insist on its close performance. It has desired most of all to offer its services in an effort to reach an intelligent solution of the problem. Primarily, the purpose was to protect investors in trucking business from their own folly. Secondarily, the purpose was to protect the public from extortion. A large number of men were entering the trucking business who had little knowledge of its difficulties and each time one of such ventures ended in disaster served to check the progress of development. The man who desired to hire trucks for cross-country work was in part protected, because in most instances he still had the opportunity of using railway service if trucking rates were too high.

I am frank to say, speaking for myself alone, that I am not at all sure that effective judgment can be reached at this stage of the development of this particular business.

There are no experience tables of sufficient scope to serve as a basis for intelligent action. Conditions in various parts of the state vary so much as to make it difficult to lay down a standard. Nebraska has almost entirely dirt roads. Many eastern states with considerable development in hard-surfaced rural roads have found it inadvisable to attempt to regulate trucking rates until the business is somewhat older and it may be that Nebraska should have followed that plan.

An adequate rate structure must be based on an average of all kinds of conditions. One trip may result in a very considerable financial advantage to the carrier, and the next trip be filled with disaster and wipe out all the profit of the first trip. The average number of days each year during which trucks can operate on dry roads has to be considered and this average is bound to differ in different parts of the state. When hard-surfaced roads have been developed, very accurate tables can be used; but, I fear very much, not until then.

I doubt also, if freight trucking can ever be put upon a very successful basis by any concern which does not develop a very considerable return load business. Our investigators at South Omaha where more than one hundred truck loads of livestock are received daily during the summer time, found that a very few indeed were reasonably certain of a return load from Omaha to the territory of origin. Many of them made no effort whatever to secure return loads. Such a situation as this will in time answer itself, but not to the advantage of the trucking business.

There have been some ambitious projects started which have not progressed far. I have in mind an Omaha corporation which was formed to develop a trucking business of magnitude. It started with a half dozen trucks. Its plan was within a year to have a fleet of 75 trucks in operation, with routes radiating from the state's metropolis in all directions.

Within three months the problems of dirt road transportation convinced this corporation that it was doomed to failure. Its trucks are now confined to business within the paved areas around Council Bluffs and Omaha.

Another present difficulty in the solution of the problems here presented lies in the attitude of the trucking concerns themselves and their customers. In the main, the trucking concerns feel that they ought to be allowed to work out their own salvation. A good many of them have no desire whatever to receive the cooperation of the state. At the present time it is impossible to police an order fixing rates. The enforcement would require inspectors constantly in the field and the state has provided no funds for this purpose. The policing must necessarily be done by those who are in the business and who desire standardization. Merchants and other patrons of trucking concerns much prefer highly competitive conditions. Such conditions are an advantage to them. So long as there is a considerable number of men engaged in the business who take no account of the cost and who desire merely to get the business without regard to whether they handle it at a loss or not, it is of course an advantage to the merchant to have such conditions continue.

The whole problem is one of evolution. The day is coming when a very considerable part of short distance freight hauling will be done by truck. It will not be successful until there is a standardization which will protect both the investor and the business public generally. And that standardization, I fear, can not be brought about successfully until we have had more experience of a longer period than we have had in the business.

The Federal Government's Part in the Country's Highway Program

(Continued from page 302)

such commission of a national system consisting of two main highways in each state and not exceeding 1% of the mileage of highways in that state, save where necessary to connect such highways with similar roads in adjacent states or neighboring countries.

These roads would be constructed to connect the principal centers of agricultural and industrial production, to lower the costs of distribution, to facilitate interstate commerce, to strengthen the common defense and to provide the nation with a second line of transportation in times of emergency.

In those states or counties where roads, which would naturally become part of a national system, have been adequately constructed, they would be taken over and a compensating mileage of connecting or correlating highways would be constructed by or at the expense of the National Government.

The actual work of construction and maintenance would be left to the state highway departments where efficient, since it is to the advantage of the Government to utilize the excellent organizations of many of these departments. The work would logically be decentralized just as it is today through regional district engineers, and the state highway departments would be left free to devote their funds to the construction of feeder and state highways.

Of course, such a system as that suggested by Mr. Townsend would be adequately constructed, but more than that, the policy as pointed out already, would be economic and have due regard for future traffic as well as present, in order that roads so constructed would not have to be torn up or replaced almost as soon as laid down. Such a policy would mean wide highways, heavy bridges; in fact, the best known type of construction throughout.

The effect of such a system would be instantaneous. The heaviest share of the burden would be lifted from the state, since these main roads will have a wide local use and will always carry the heaviest traffic. They will set up an object lesson of untold value to the road program since every community will at once desire to emulate the National Government and be linked up with its network of roads.

Any thought is unbelieveable that such a program would detract in the slightest from the interest of communities in road construction. More federal money would be spent in the state than will ever be appropriated under the present plan and better local as well as national results will follow.

Further, one fact should be kept clearly in mind. There are today more than 7,500,000 motor vehicles on the highways and byways of our country. The number will be increased by the millions from year to year. About 30,000,000 people ride over our roads every day. Thus you will see that highway transport touches the lives of every one of our citizens. Its constantly increasing importance in the economic and social fabric of our existence requires a national vision and administration and expenditures in proportion.

The vast increase in motor usage is bringing about a keener appreciation of the whole question of road construction than we have ever had in the past. The highway user is an intelligent critic. He demands an equitable apportionment of the costs of construction among all beneficiaries. He demands roads which will be adequate for economic transportation. He demands roads which begin somewhere, go somewhere, end somewhere. He has sensed a lack in the present policy. He sees that as our transportation evolves, our construction policies must evolve also.

No longer is road building a task to be classed with ordinary construction work. Already there is growing about it something of the glamour and romance which in other days attracted men so strongly to railroading. The man who goes to college today to take a course in road engineering or in highway transportation sees a new tradition in the building. He sees rural life quickened, morals heightened, costs of living lowered, and the standards of a nation in the process of a remolding.

It is not too much to say that American industry and science have forged a powerful new weapon in the motor vehicle which will some day, not far distant, bring about a quiet but none the less potent revolution in American life, as well as in life in other countries.

It is the duty of our Government to see that this revolution should have an economically sound basis and should be carried out under proper federal guidance with a dollar's worth of highways for every dollar expended. We cannot let the present inadequate law bring discredit upon the whole highway movement and set the brakes on the development of this new and vital mode of transportation.

On the day when passage of the necessary legislation by Congress provides proper highway administration and a federal system, the national life of our country will receive an impetus beyond the vision of any of us. Let us recognize the mistakes of the past and pledge ourselves to a clear and forward vision of the future.

———ooo———

Norfolk County, Ont., Canada, will construct a Strauss trunnion bascule bridge across the head of the harbor at Port Dover, Ont.

Work on the Road between Miami and Afton, Okla., has been resumed after being delayed two months because of a controversy over the interpretation of specifications. The road under construction is 18 mi. in length and will cost $330,000.

MEETINGS

Calendar of Coming Meetings

June 16-18.—North Carolina Good Roads Association—Annual Convention, Asheville, N. C. Acting Secretary, Miss H. M. Berry, Chapel Hill, N. C.

July 6-8—Conference of Mayors and Other City Officials of the State of New York—Annual Conference, Jamestown, N. Y. Secretary, William P. Capes, 25 Washington Ave. Albany, N. Y.

Oct. 12-15.—American Society of Municipal Improvements.—Annual Convention, St. Louis, Mo. Secretary, Charles Carroll Brown, 404 Lincoln Ave., Valparaiso, Ind.

PERSONAL MENTION

L. E. Strahm has been appointed city engineer of Kent, Wash.

E. H. Jeffries has been appointed city engineer of Manteca, Cal.

H. H. Fielder has resigned as engineer of Erath County, Texas.

E. M. Evans has been appointed city engineer or Norwich, N. Y.

L. D. Parks has been appointed county engineer of Erath County, Texas.

Charles Greenwood has resigned as engineer of Lewis County, Washington.

Roy L. Green has been appointed engineer of Lewis County, Washington.

Warren E. Darrow has resigned as commissioner of public works of Utica, N. Y.

Daniel T. Butterfield has been appointed commissioner of public works of Utica, N. Y.

H. E. Sn[illegible]

[illegible] has been appointed city manager of Dubuque, Iowa, at a salary of $700 per month.

R. V. Newcomb has resigned as engineer of District No. 2, Wyoming State Highway Department.

J. E. Pierson has been appointed engineer of District No. 2 of the Wyoming State Highway Department.

L. A. Wilson, formerly with the Iowa State Highway Commission, is now with the Holt Manufacturing Co., Peoria, Ill.

Julian Montgomery has resigned as engineer of Rockwall County, Texas, to become city engineer of Wichita Falls, Texas.

F. Cotter has been transferred from the Portland office of the U. S. Bureau of Public Roads to the Missoula, Mont., office.

L. F. Martin has been appointed chief of party with the U. S. Bureau of Public Roads and will be located at Missoula, Mont.

E. L. Alspaugh, formerly with the Oregon State Highway Commission, is now with the U. S. Bureau of Public Roads and is stationed at Missoula, Mont.

John N. Mackall, for the past two years chief engineer of the State Roads Commission of Maryland, has been appointed chairman and chief engineer, succeeding Frank H. Zouck. With the exception of two years, Mr. Mackall has been connected with the Maryland State Roads Commission for 16 years.

OBITUARY

Bion Bradbury, formerly Commissioner of Public Works, Portland, Me., died recently at Cape May, Me.

Thomas Ryan, former Superintendent of the City Water Bureau of Chicago, Ill., died May 31 at his home in that city.

———ooo———

The Missouri State Highway Department recently approved ten applications for federal and state aid on roads, aggregating 106 mi., at an estimated cost of $1,105,262. A total of 1,707 mi. of state road projects have been apprvoed within the past year.

Winn County, Louisiana has called a special election to vote on a $1,000,000 bond issue to be used to build roads. At the same election the voters will pass on a special road maintenance tax of 2 mills for five years and a special tax of 4 mills for five years to build a court house.

The Pennsylvania State Highway Department let a contract for the construction of 38,315 ft. of highway on Route 162 between the Pottsville-Mechanicsville line and the Middleport-Blythe township line. Mangan & Risser, of Lebanon, were awarded the contract for $558,754.60. Another contract let at the same time calls for the construction of 7,300 ft. of highway in Harbor Creek Township, Erie County, and was awarded to the Good Roads Construction Company, of Erie, for $83,839.50.

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

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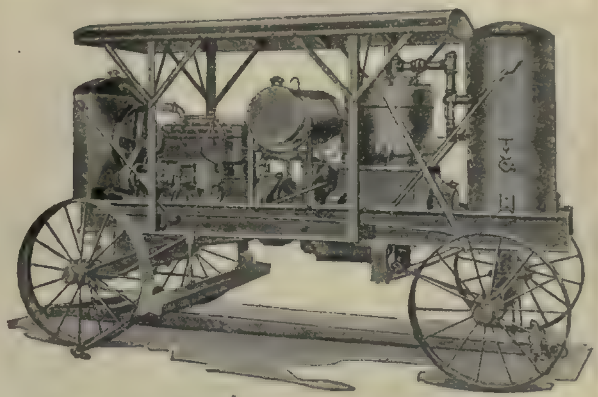

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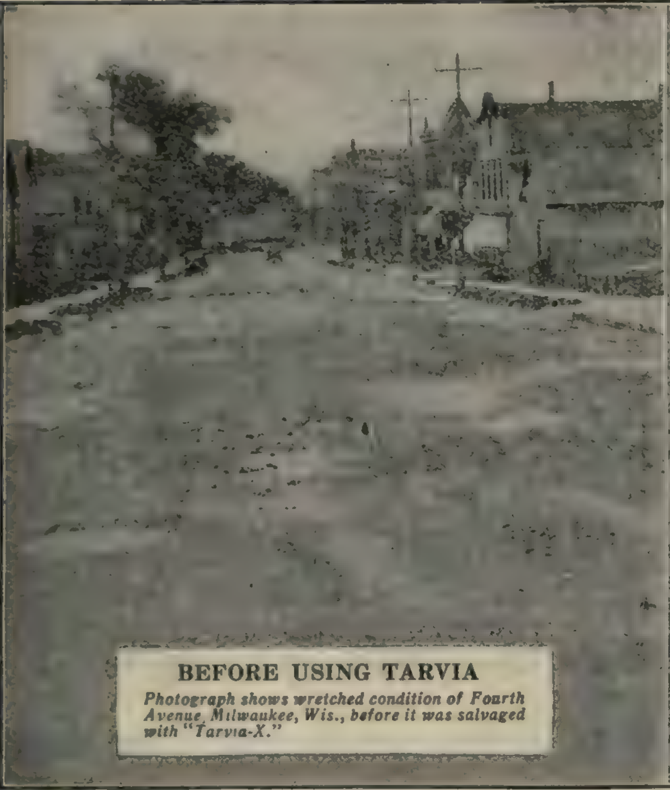

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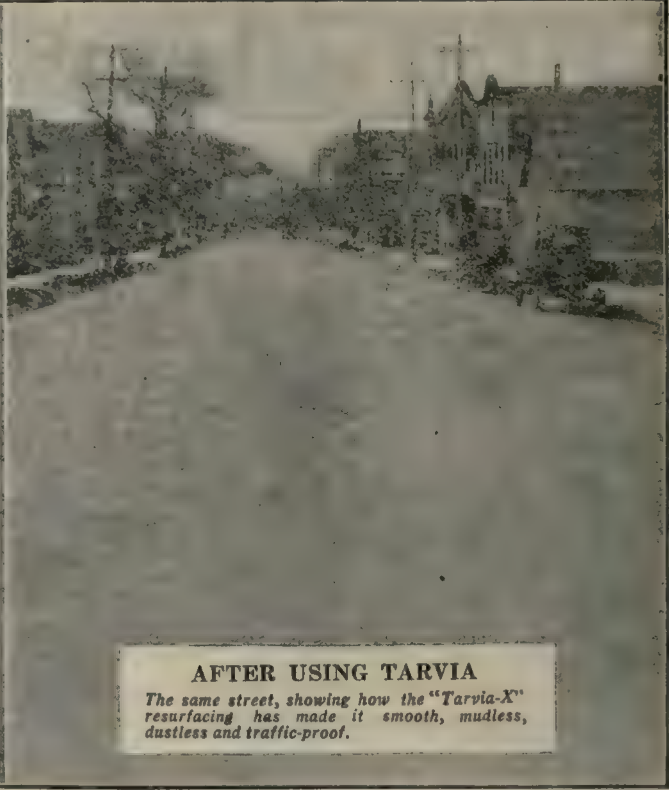

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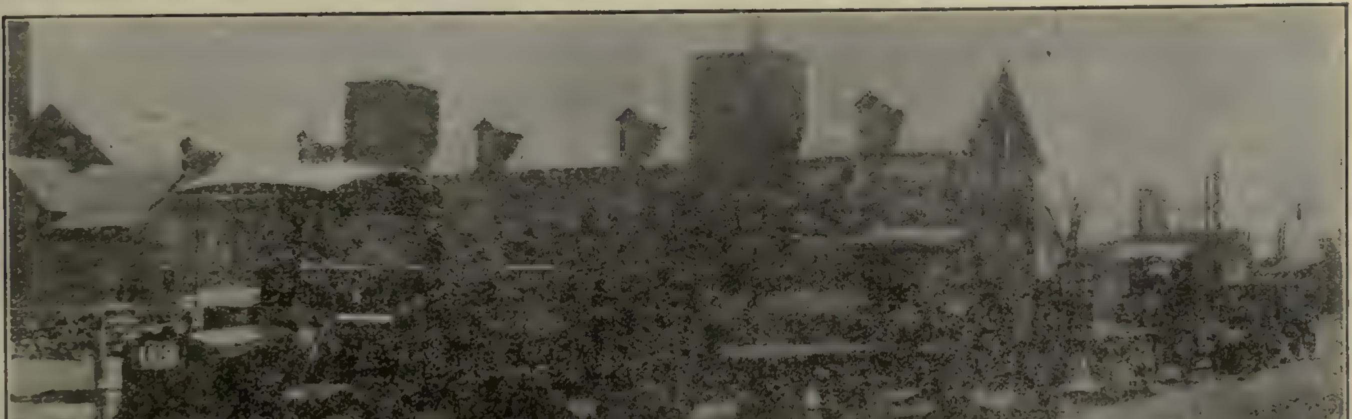
Relation of Tractor and Trailer Traffic to Highway Design*

By H. ELTINGE BREED†

Tractor and trailer traffic is a sure thing. Highway design is a glittering uncertainty. I have taken the liberty of changing my assigned topic so as to make the variable depend upon the more constant—"The Relation of Highway Design to Tractor and Trailer Traffic." Didn't most of you, in one of "life's thrilling moments," see yourselves as orators, holding a vast assemblage spell-bound? And, along in high school debating, dig deep into Quintilian and the "Rules of Oratory?" I remember Quintilian was strong on defining terms. Somehow, I caught the habit.

By tractor and trailer traffic being a sure thing, I mean just this: It is here to stay. There are registered in the country today 35,000 trailers. That is definite; so is their percentage of increase in the last two years—over 100%. At this rate of increase we can plan for 500,000 tractors and trailers by the year 1930. The only uncertain factor is whether the rate of increase will itself increase, and how much. I, personally, believe that we should plan for at least double the number of tractors and trailers given above.

Events of the past two years have caused many doubts as to whether the great occasion always does produce the great man. But, at least, in this mechanical age of ours, the advent of the tractor and



AN EXAMPLE OF TRUCK AND TRAILER TRAFFIC—OUTFITS USED TO HAUL MILK, EACH TRAILER TO CARRY 40 CANS—EAGLE TRAILERS HAULED BY BROCKWAY TRUCKS trailer is one indication that the great industrial need always produces the means to fulfill it.

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*Paper presented at the annual meeting of the National Highway Traffic Association, New York, N. Y., May 13, 1920.

†Consulting Engineer, formerly Second Deputy Commissioner, New York State Department of Highways.

The crux of the economic situation as I see it in this country today is, even more than production, distribution—distribution of the products of the soil, of labor, of machines; and fairer distribution of the wealth that accrues from these products. The motor truck and the tractor and trailer have been developed to meet the need of distribution.

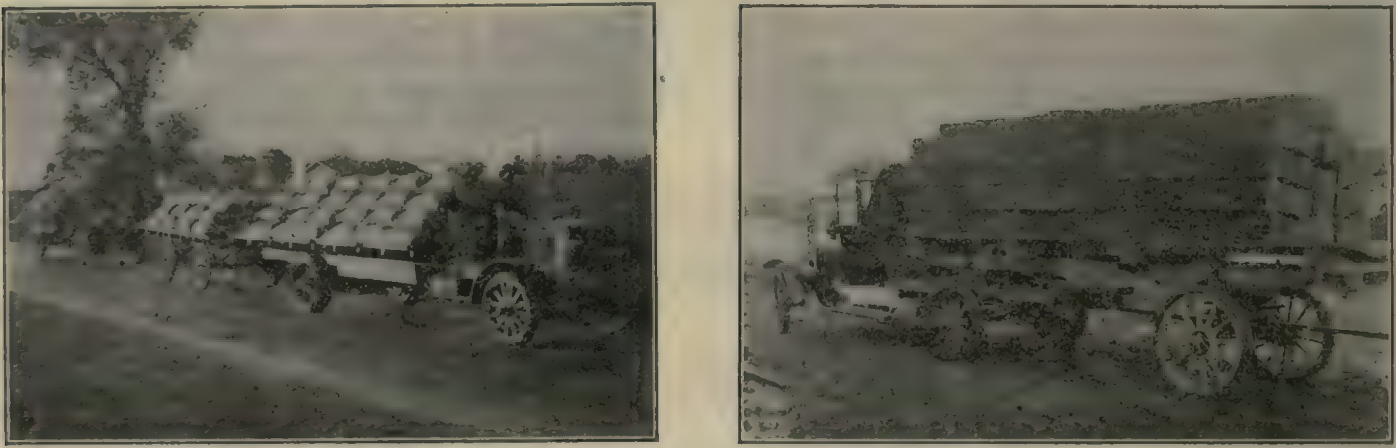
The railroads can not meet this need. Industries in the Middle West are being forced daily to shut down because of the shortage of freight cars for the transportation of material. Farmers the country over are frantic with anxiety about the movement of their crops. Congress and the Interstate Commerce Commission and the Car Service Bureau and how many others squabble and muddle along with no prospect of adequate solution. Whatever relief we get this year and next will be from motor transportation.

Much as we need distribution we need even more economy in distribution. It is appalling to realize that we, as consumers, pay from 3 to more than 10 times the actual cost of the finished article, be it manufactured or natural product. It is disquieting to reflect that we are the only rich nation in a bankrupt world. It is still more disquieting to hear the hollow reverberations of much of our wealth. Whatever effects a saving in cost to the consumer is a national boon. Motor power for short-haul freight does effect such saving. That, I believe, is the great reason for its rapid growth. Mr. Banham says:

"I find on shipments moving from Newark to Yonkers, that if we combine all the costs, that is additional costs, to make a less than carload shipment, the rate averages $1 per hundred. If you take the same movement by motor truck, with decreased boxing, decreased weight and decreased labor, you will find that the rate averages 20 ct. Between Newark and Yonkers there is a difference of 85 ct. per 100 lb. in favor of the motor truck."

There is also the very important saving in gasoline which results from the use of the tractor and trailer over the ordinary truck. The trailers make it possible for one tractor truck, one driver and one motor to do the work of three. With the motor truck they have met the industrial need. Today, in the tie-up in New York harbor, they are coming to the rescue, and moving the foodstuffs. More and more they are becoming to the great cities the strongest assurance of a sufficient food supply. Those of you who had babies or invalids to care for during the milk crisis in January, 1919, will remember with gratitude the Walker Gordon milk trucks.

But in the uncertainty of highway design, motor transportation suffers a serious check. I say "uncertainty" because this spring improved roads have gone to pieces as they never have before. The Lincoln Highway between Trenton and Philadelphia has completely "busted up." Some people say that the damage is due to the hard winter. That I disbelieve. Weather is a natural process that should not hurt a healthy, protected organism, either human or highway. The roads are organically wrong, because they are not designed for the loads they must bear. Unless they can sustain the necessary traffic they do not fulfill their function. They hinder, instead of help, distribution. The saving effected by motor transportation more than offsets the cost of the roads that are essential to this transportation. Their economic value to the country cannot be expressed wholly in terms of the dollar.



Trucks and Trailer Carrying Grain

Trailer Truck Loaded with Shingles

EXAMPLES OF PRESENT-DAY TRAILER TRAFFIC ON THE HIGHWAYS

Adequate design of highways for tractor and trailer traffic, means an immediate provision for three lines of traffic near all large cities and on all trunk routes, with the possibility of an added 10 ft. longitudinally for a fourth line. For each line of traffic at least 9 ft. should be allowed. The additional width is necessary because tractors and trailers move at a speed of from 6 to 12 mi. an hour, and other cars going from 12 to 40 mi. must have room to pass.

Turns must be widened because of the greater length of the tractor and trailer, and curves must be superelevated in order that they keep in their own line of traffic.

With the increasing cost of motor fuel, special attention must be given to reducing grades. The consumption of gasoline increases directly with an increase in grade. On a fairly level road you can haul a heavier load for less fuel. This saving on main roads heavily traveled often compensates in a year or two for whatever additional cost is involved in reducing grades.

Because of the distribution of load over 6 or 8 wheels, and because of their slower movement, tractors and trailers are less hard in impact upon pavement than heavily loaded trucks. They would not require any greater strength of foundation or better type of surfacing than we would provide for regular heavy traffic—but all heavy traffic requires an adequate foundation and a durable type of pavement. A semi-durable pavement for heavy traffic is sheer waste. I become more and more convinced, however, that the final success of road building depends upon the intelligence of the public. The public must not only demand good roads, but that part of the public represented by the Highway Traffic Association must know enough about what constitutes a good road to act as a spur to the sometimes sluggish consciences of engineers and contractors. Public knowledge prevents private graft.

Good roads require an alert, intelligent public, engineers with vision, competent contractors. These factors, and the training in highway work that some universities are now giving, and the urgency of the need itself, will gradually produce highways that will be adequate to demands of tractor and trailer traffic.

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Federal Participation in Road Construction*

By **J. A. WHITTAKER**†

Beginning with the establishment of the United States as a nation, its statesmen, desirous of developing the resources of the country, early concluded that a means of communication was essential; and the historian finds the question of building roads and canals a prominent one during the administrations of Presidents Adams, Jefferson, Madison and Monroe.

The first legislation, which appears to be in 1802, called for the construction of a road from the Potomac River to the Ohio River, which by subsequent acts was authorized extended to the Mississippi River. This road, now known as the "National Road," is about 677 mi. in length and there was expended during the years 1802 to 1837 nearly $7,000,000 for its construction and maintenance. As men experienced in highway construction and maintenance, you can readily visualize what a dilapidated monument to federal participation in road construction this became through years of neglect due to lack of funds.

About 1837 it had been demonstrated that the railroad was a more economical means of transportation for long distances than wagon road, and the thought, energy and resources of the country were turned to developing a railroad system. For the next 75 years, we find practically all road legislation devoted to the development of such a railroad system apparently with the thought that the building of wagon roads was a local matter and should be left to each local community. But when the railroad system was practically completed it was found that the local communities had not developed satisfactory road systems. With the rapid development of motor-driven traffic, grew the demand for improved highways constructed under the direction of men skillled in this type of work. A number of states attempted to solve the problem by providing state highway departments which should have charge of the construction and maintenance of important roads. To a certain extent this was successful, but in those states where political affiliation rather than engineering qualifications dictated the selection of the personnel of the highway departments, the plan afforded but little relief.

In 1912 Congress made an appropriation of $500,000 to be expended by the Secretary of Agriculture in cooperation with the Postmaster General in improving the condition of roads to be selected by them on which rural delivery was established or might be established, and provided that such improvements should be made under the supervision of the Secretary of Agriculture. This appropriation was made contingent on the contribution by the state or its civil subdivisions of double the amount provided by the Federal Government. There was thus placed under the immediate supervision of the Bureau of Public Roads $1,500,000, the expenditure of which furnished data of much value; and the results have been responsible in no inconsiderable measure for the larger provision made in the passage of the Federal Aid Road Act, approved July 11, 1916.

As you all know, this law, in brief, appropriated $85,000,000 to aid in the improvement of such roads as are now or may be post roads, and provides that the work shall be done through a cooperative agreement between the Federal Government and the several states, the Secretary of Agriculture to act for and on behalf of the Government and the several state highway departments for and on behalf of their respective states, except that states desiring to receive their proportional parts of the appropriation must through their legislatures consent to the provisions of the act of Congress.

In general, the act provides that the State Highway departments shall initiate schemes, projects and plans for cooperative road work in their respective states, and gives the Secretary general authority to approve or disapprove them. Furthermore, it sets out how he may cooperate and outlines certain things that the states shall do if they desire their proportional parts of the federal aid funds.

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*Paper presented at a meeting of the New Hampshire Good Roads Association.

†U. S. Senior Highway Engineer.

The act authorized the Secretary of Agriculture to cooperate only with the state highway department. Consequently many states, in order to enjoy the use of the cooperative funds, were obliged to establish state highway departments in fact as well as in name and equipped with funds for performing their parts of the work. A state highway department, empowered to initiate and execute the construction of any road logically a part of a state highway system and authorized to cooperate with the federal officials; an appropriation equal to the state's portion of the federal fund; and a provision for maintaining the roads that mught be constructed were essential.

The act in providing that only a portion of the amount appropriated should become available each year for five years, initiated a five-year program. The state departments were, therefore, required to submit a program of the work contemplated during the five years, which should reveal to the federal officials that the roads constructed during the five years may form a complete structure or units of a structure already begun or contemplated. It has been the policy of the department from the outset, in order to prevent haphazard action, to have the state highway authorities prepare and present tentative state systems of roads. It was apparent that rigid systems not subject to modifications as conditions might require would be inadvisable. Each state has worked out a system and, in general, it is being followed in the development of projects and the construction of roads. In formulating these systems the engineers are giving due regard to interstate connections, that is to roads connecting the system of one state with that of another, and as progress is made the construction of through roads will follow as a matter of course.

When initiating proceedings under the act the Secretary, desirous of the active cooperation of the states, called in consultation representatives of the then existing state departments for the drafting of rules and regulations governing the procedure and conduct of operations under the act. Today, after three years' existence, there continues a board representing the state highway departments to consult with the federal officials regarding changes which are believed desirable in the rules and regulations governing procedure or even to outline and formulate desirable legislation.

As the result of this intimate cooperating between the different departments making known the necessities of the nation, Congress, at its last session, appropriated $209,000,000, in addition to the $85,000,000 provided in the original act, for the extension of road construction in cooperation with the states, and also made some important amendments to the act. The definition of the kind of roads that can be constructed was greatly broadened and the limitation on the federal contribution for any one road was increased from $10,000 to $20,000 a mile.

These amendments have greatly facilitated consideration of and action upon projects submitted by the state highway departments.

Acknowledging that all states now have state highway departments duly empowered to cooperate with the Federal Government under the terms of the act and amendments thereto, and with sufficient funds at their disposal for the operations thereunder, then the requirements of a project are three, namely;

(1) That the road must be a "rural post road" as defined in the act as amended; that is "any public road a major portion of which is now used, or can be used, or forms a connecting link not to exceed 10 mi. in length of any road or roads now or hereafter used for the transportation of the United States mail."

(2) That the roads shall be "substantial in character." This means that the road must be so constructed that it will carry the prospective traffic with such maintenance expenses that the total annual charges will represent a reasonable expenditure for the public service rendered by the highway.

(3) That the amount contributed from the federal treasury in connection with any road shall not exceed 50% of its cost or $20,000 a mile.

Under the definition that the word "road" includes all bridges and structures appertaining to the use thereof, the department has interpreted that federal funds may be expended in the construction of bridges. These may be included in the road project or one large structure may be considered in itself a project. The Government's share in the cost for such projects is limited to 50%, and this without the governing factor of $20,000.

Under the original act, the proportion of funds allotted to the State of New Hampshire amounted to $312,433.85, and under the amendment of Feb. 18, 1919, the allotment is $830,655.14, a total of $1,143,088.99. Towards the contemplated expenditure of this sum, on a basis of 50% cooperation, the state highway department submitted to Dec. 31, 1919, 86 projects estimated to cost $1,189,704.60. These projects contemplate the improvement of 104.9 mi. of road and the construction, as separate projects, of three bridges estimated to cost $36,232.51.

For all the states since the passage of the Federal Aid Road Act., and to Nov. 1, 1919, 1,927 projects have been approved. These call for the construction of 18,596 mi. of road at an estimated cost of $225,267,847, of which about $95,498,140 will be borne by the Federal Government. For the national forest road, work, to Nov. 1, 1919, 74 projects, involving 923 mi. of road, were approved, and plans were

(Continued on page 323)

GOOD ROADS
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Copy for advertisements must reach the New York office by noon on Tuesday of the week before date of issue if proofs are to be submitted.

Copy for classified and other advertisements where proofs are not required will be accepted until noon on Monday of the week of issue.

Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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ROAD RESEARCH

A wealthy man really desirous of using a part of his money for the benefit of his fellows could do few things of more service than to devote an ample sum to financing experimental work in highway engineering.

While great progress has been made in the science and art of road building, there is still a wide field for investigation. There is very little reliable information on the relative wearing qualities of different types of surfacing; there is a lack of knowledge of drainage and other subsoil conditions; costs have not been recorded and studied sufficiently. Besides the questions of construction and maintenance, there are almost numberless unknown factors in the general problem of transportation. Data are lacking on tractive resistance and on costs of operating vehicles on pavements of different types. The effects of grade and alignment on operating costs have not been evaluated. There are also economic and administrative problems without number that could be studied with profit.

The investigation of these matters requires time and money—more of both than can be supplied from present sources. Much valuable work has been and is being done by state highway departments and by the Bureau of Public Roads, but with the former such work is necessarily a side issue and the Bureau is hampered by a lack of funds and by its subordination to the Department of Agriculture.

Most of the money wasted in road work has been wasted because of lack of data on subjects such as those to which reference has been made. At this time, when highway work is of such vital import to the country's progress, the financing of research work would be a particularly worth-while undertaking from the standpoint of public benefit.

THE ROAD BUILDER'S JOB

The present is a time of change and readjustment. The world has come through a great war that has left its marks on every phase of human activity. The most obvious effects, so far as the average citizen is concerned, are the high cost and scarcity of the things he needs.

What special significance have present conditions for the road builder?

First, they mean that his work is more important than ever before. The lack of production and the difficulty—if not impossibility—of bringing it back to normal in the near future make still more urgent the need of better distribution. And highways are the logical means of improving distributing facilities.

They also mean that the road builder's work is more difficult than it ever was before. Funds are available, as a general thing, except where work must wait upon bond issues that present market conditions make difficult to sell, but labor and materials are costly and hard to get.

Another meaning that present conditions have for the road builder is that at almost any time he is likely to find himself out of a job. The difficulties surrounding the prosecution of road work have given rise to a tendency to curtailment and retrenchment. Though economically wrong, this is a factor that cannot be ignored.

Lastly they mean to the road builder just what they mean to almost every salaried man—a never ceasing struggle to meet doubled living costs with a salary that has been increased but little.

What existing conditions mean to the road builder, then is that for remuneration that is really less than it was several years ago he is doing work that is of greater importance than it ever was before and that must be accomplished under difficulties that he has not had to face in the past. And in addition, at any time he is likely to find himself out of a job.

The road builder's pay should be brought to a point where it would be commensurate with the importance of his work and with the pay for other work calling for a like degree of skill and responsibility. Until it is, we can expect to see more and more men leave state and county road departments for better paid positions with private enterprises.

Illilnois Citizens Protest Against Suspension of Road Building

Petition Signed By Inhabitants of Five Counties Urges State to Use Bond Issue And Not Gaze at Mirage of Lower Prices

That the suspension of road building in Illinois and the postponement of the use of the $60,000,000 bond issue voted in 1918 by the people for improving the highways of the state do not receive unanimous approval, is evidenced by a petition prepared by citizens of Stephenson, Winnebago, Boone, Kane and McHenry Counties.

Route No. 5, known as the Grant Highway, extends through these counties and the petition requests that the state proceed with road building as originally planned. It is further pointed out in the petition that Grant Highway is one of the most important overland routes in this country and that it is futile to stay improvement of this road in hope for lower construction costs, for the economic situation is such that the high price level of labor and materials will not recede appreciably during the next five to ten years. The petition is addressed to Governor Lowden and the state highway officials.

Federal Civil Service Examinations For Highway Bridge Engineers

The United States Civil Service Commission announces open competitive examinations for the positions of highway bridge engineer and junior highway bridge engineer. Vacancies in the Bureau of Public Roads will be filled from these examinations and appointees at an annual compensation of $2,500 or less may be allowed the temporary increase of $20 per month granted by Congress.

The duties of these positions involve superintending the construction of bridges of various types throughout the United States and cooperating with state highway departments in connection with the provisions of the Federal Aid Road Act. In addition the duties of appointees will be the inspection of bridges and investigation of bridge building materials, administrative organization, methods of management, inspection of bridges locally and giving advice in regard to their improvement, etc. The work will also include making surveys of bridge sites, design and preparation of plans for bridges, and the review of plans and specifications.

Competitors will not be required to report for examination at any place, but will be rated on the sworn statements in their applications and upon corroborative evidence. Education and preliminary and general experience will be weighted at 45 and special experience and fitness at 55.

Applicants for highway bridge engineer must be graduates from engineering colleges, who have had at least three years practical civil engineering experience and two years' experience in the direction or performance of important bridge engineering, of which at least one year shall have been in the design of highway bridges. Applicants not college graduates may submit six years' preliminary experience in engineering in lieu of the four-year college course.

Applicants for junior highway bridge engineer must be graduates from engineering colleges, or have had six years' preliminary experience in practical civil engineering, and at least two years' subsequent experience in civil engineering, of which one year shall have been in highway bridge engineering.

Applicants for highway bridge engineer must be under 35 years of age and applicants for junior highway bridge engineer must be under 30. Men honorably discharged from the Coast Guard are entitled to preference.

Engineers desiring to become applicants should apply for Form 1312, stating the title of the examination desired, to the Civil Service Commission, Washington, D. C. Applications must be filed with the Civil Service Commission not later than July 13, 1920.

Appointments will be made to the position of highway bridge engineer at salaries from $2,100 to $2,700 per year and appointments of junior highway bridge engineer will be made at salaries from $1,320 to $1,920.

Missouri Bankers and Labor Associations Indorse Road Bonds

The proposed amendment to the constitution of Missouri providing a bond issue of $60,000,000 for highway development has been endorsed by two important organizations of that state, the Missouri State Bankers' Association and the Missouri State Federation of Labor. The $60,000,000 good roads amendment will be voted upon at the November election.

Experimental Road in Somerset County, England

A number of experimental road surfaces will be laid in Somerset County, England, according to "Municipal Engineering and the Sanitary Record." The road surfaces will be laid on the Bristol-Exeter main road near Taunton, and will be subjected to the heavy traffic which passes over this highway.

Eight types of construction will be laid, each section being 220 yd. long and 7 yd. wide. The sections will consist of reinforced concrete; granite macadam bound with "Rocmac;" granite macadam bound with "Vianex;" "Tarmac;" tarred limestone; limestone grouted with "Asphaltmac;" granite macadam grouted with "Asphaltmac;" and "Monolastic" paving.

In order to give each material a fair test, the whole of the roadway will be thoroughly drained and weak places in the subgrade eliminated, at an estimated cost of about $10,000.

New Hampshire Goods Roads Association

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The quarterly meeting of the New Hampshire Good Roads Association was held at Frankin, N. H., on Thursday, June 10. The business meeting of the association was held at the Grand Opera House in the forenoon, the meeting being called to order by President Winfield M. Chaplin at 11:00 a. m.

The minutes of the preceding meeting were read and approved.

Applications for membership were received, three active and one associate member. It was voted to send a letter of condolence to the family of the late Superintendent of Streets of Franklin, who was a member of the association.

The question of snow plows and snow remover was discussed at length, Mr. French of Laconia, Mr. Rogers of Boston, Mr. Rhodes of Worcester and Mr. Brooks of Keene taking part in this discussion.

The matter of clearance of overhead bridges was also taken up. Mr. P. J. Guay, of Laconia, who was elected an associate member, explained to the members that on two occasions his trucks containing loads of furniture from Boston to points north were forced to stop on the south side of the overhead bridge, reduce their load and repack same after going under the bridge. It was also mentioned that in several places it was practically impossible for two machines to pass at the same time under the overhead bridges on account of the cut in the bank not being wide enough. It was decided, however, not to take any action on this matter at the present, but at the next meeting the matter is to be talked over again.

Mr. Winslow, of Nashua, informed the members that a movement was being made to place an embargo on materials for road construction, including cement, stone, and other materials. At the present time, Mr. Winslow stated, there are several carloads of bituminous road materials both in barrels and tank cars en route to contractors, city, town and state officials, and they are moving very slowly. A motion was made by Mr. Winslow and seconded by Mr. Tolles, of Nashua, to forward a copy of this motion to the Senators and Congressmen throughout the State of New Hampshire, it being also suggested that members take a personal interest in this matter. At 1 p. m. the meeting adjourned to luncheon served in the vestry of the Baptist Church by the Assistant Superintendent of Streets at Franklin, N. H., and his crew of K. P.'s, (kitchen police.)

After a very delicious meal, speeches were in order, the guest of the day being Maj. Cain who explained to the members about the efficient method of road construction in France, as well as a very up-to-date map system. The major was very interesting and certainly the members appreciated his talk.

The next speaker was Lieut. John D. Devir, of Malden, Mass., who also served overseas and who is an expert road builder. Lieut. Devir took very strong exception to the major's remarks about France being a thousand years ahead of America in the art of road construction. Lieut. Devir stated that they were building roads in France a thousand years before we were in America, but at the present time we were two thousand years ahead of them. Lieut. Devir did not believe that we should send our road builders to France for instruction, as suggested by the major, because traffic conditions in this country are far more difficult to handle than those in France. He explained to the members his experience in building one stretch of road in France under the supervision of a French lieutenant colonel, telling the members they built about 5 mi. of road under their method and when they returned to this some two months later, a fleet of United States Government trucks were stuck in the mud, which again proved that America was a good school for road builders.

Following Lieut. Devir, Joseph Killory, of Laconia, N. H., was introduced and he also told of his experience in building roads in France.

The day's outing ended with an automobile trip to Webster Lake over a section of the recently improved Andover Road. At the close of the road inspection trip the party stopped at the summer home of Mr. and Mrs. Ralph B. Griffin for light refreshments and a stroll about the broad verandas of the spacious cottage facing the expanse of the lake. With a good-bye to Mr. and Mrs. Griffin, the party returned to Franklin and the visitors left on the evening trains for their homes.

Mayor Wittaker was assisted in carrying out the arrangements for the outing by Rodney A. Griffin, as chairman of the general committee, Alvah J. Davis, chairman of the luncheon committee, and Ralph B. Griffin, host at the lake, Among the guests were Mayor Henry E. Chamberlin of Concord, Commissioner of Motor Vehicles Olin Chase, of Concord, and representatives of the State Highway Department.

The long standing differences between Mayor Moise Verrette, of Manchester, and Michael F. Shea, Director of Public Works, existent since the latter's appointment by the commissioners of public works last December are in process of elimination and it is understood that the mayor will recognize Mr. Shea in an official manner at a very early date. According to the best information obtainable, the only hitch is a difference as to the exact salary to be paid to Director Shea.

It is understood that the mayor is favorable to recognition. He feels that so long as Director Shea was legally chosen last December to head the department, when all the commissioners were aware of the fact that new bridges would probably be constructed, it is the part of wisdom in the light of the best interests of the city to officially recognize him and thus remove the differences between the two officials that thus far have resulted in retarding the bridge construction program.

State Highway Commissioner Everett has awarded the following federal aid contracts for road construction:

Work in Concord has been let to Louis Davis, of Sunapee, the job to be completed in six weeks.

A road in Lebanon has been given to Vogel and Hadley, of Manchester.

The Collins Construction Co., of Andover, Mass., is to do highway work in Fitzwilliam and also in Rochester.

A verdict for $5,683 for the plaintiff was returned by the jury in the case of Burleigh Nelson, Administrator of the estate of Dr. E. E. Jones, against the Town of Stratford. The plaintiff recovers from the town for its failure to have the highway properly protected. The suit is the result of finding Dr. Jones, a well-known physician of Colebrook, dead beneath his automobile on an embankment near the highway. The case was heard by Chief Justice Kivel.

Massachusetts Highway Association

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Announcement

This section of the paper is open to members of the Massachusetts Highway Association for the discussion of matters directly connected with road interests. Members are requested to submit items of interest for use in this column.

Address all communications to GOOD ROADS, P. O. Box 2705, Boston.

News and Gossip

The summer field day of the Massachusetts Highway Association was held in Quincy and at Nantasket June 3, and the delightful weather gave the several hundred members of the Association opportunity to enjoy one of the best days in their history. The Association is made up of the municipal officials interested in road building throughout the state, and several hundred mayors, selectmen, public works commissioners and street superintendents were assembled in a happy "get-together" meeting.

The party assembled in City Square between 10 and 11 a. m. and the first step in the program was a visit to the Squantum Works. The drive along the Quincy Shore to the works was a delightful one and an interesting inspection trip was made through the plant under the guidance of Edward Moore, of the Bethlehem Co.

Upon its return to City Square, the party visited First Church and a group picture of the party was taken on the church steps. The party then adjourned to the Council Chamber where the freedom of the city was extended and a delightful Thompson luncheon was served through the courtesy of Mayor Whiton.

After the luncheon, the party drove through the housing development and made a trip through the Fore River Works, where the thousands of busy workmen furnished an interesting sight. The trip was then resumed to Nantasket, where dinner was served at Paragon Park. The menu was the regular park dinner of the seashore variety, and during the dinner there was an elaborate cabaret show.

After dinner there was a short speaking program and Councillor James A. Watson of Boston presided. The speakers were Clarence Nickerson, Chairman of the Hull Selectmen and the following Mayors: Adams of Springfield, Whiton of Quincy, Gleason of Brockton. Beale, of the State Department of Public Works, represented the Commonwealth in the speaking.

After dinner the members of the party spent some time at the beach, enjoying the cooling breeze. The return to Quincy and Boston was made in the early evening.

Mayor Peters of Boston has awarded the first two paving contracts of the year. The more important of the two was for laying wood block pavement on Devonshire St., between Water and Franklin Sts., to James Doharty, whose estimate of $18,417.64 was the lowest of five bids received. The other contract was for laying Topeka pavement in Havelock St., from Blue Hill Ave., to Morton St., in Wilcock St., from Blue Hill Ave. to Morton St., and in Wollaston Terrace, from Woodrow Ave. to Jones Ave., all in Dorchester. The award was to the Rowe Contracting

Co., whose estimate of $29,525.20 was the lowest of three bids.

A recent court decision is of interest to all highway officials for it involves a liability on the town or city if it places silent policemen, so-called, at intersecting streets.

In New Haven, Conn., an automobile driven by an attorney collided with a "sentinel." He and other occupants of the car had slight injuries and the machine was damaged. A verdict of $3,500 against the City of New Haven was appealed but was upheld by the highest court.

Freight transportation by motor truck has ceased to be a problem. But what has become of its development in the East? In the most congested section of the country, from a transportation standpoint, it has received the least recognition. Good roads, well cared for should be the great incentive, but the West, with its highways far less suited to transport problems, is holding up the East to scorn.

The failure to interest big capital, lack of definite organization, with the attendant fear of unfair competition, lack of aggressiveness on the part of the men who are in a position to assume the aggressive, may be reasons why motor transportation has remained at practically a standstill in this section.

New England is the ideal section to develop. The nearness of its towns and cities, the dependence of one upon the other, excellent and well kept roads, and, chiefly, the demand for such motor service, surely call for highly developed and closely organized transportation by trucks.

Railroads frankly admit during certain periods their inability to handle freight promptly and with requisite care. At the same time they call attention to the great expense involved in efficiently uniting communities, in the laying of rails, of maintenance, of adding the necessary equipment and to the lack of revenue sufficient to maintain a satisfactory service, to say nothing of dividends. Then during prosperous times there looms up the car shortage, and freight to be conveyed only a few miles suffers by this lack of equipment.

Certain factors recently developed as a result of the extreme weather conditions of the past season, the so-called "outlaw strike" and the resultant shortage of coal and a still further accumulation of freight have greatly aggravated the situation, but they have simply added to what was already a deplorable condition.

As is well known, one of the fundamental theories of successful merchandising—recognized today more than ever before—is a quick turnover of stock. And this under existing conditions is practically impossible. Furthermore, as frequent turnovers permit of a smaller margin of profit, the medium of this quick turnover, viz., the motor truck, may reasonably prove a potential factor in reducing the high cost of commodities.

The point of this brief is not only to point out the wonderful advantages of increased motor service in these eastern states but to impress upon chambers of commerce, civic committees, and business men generally, the yet unfilled need of intertown communication during all seasons so that all dependence shall not be placed on what might be termed an antiquated service made so by faults of policies and organizations of the past and for which no one group of men may now be held responsible. The problems are great and attempts are being made to meet them, but it is beyond the scope of those in authority to provide at the moment for the increased service demanded.

So transportation is more and more a problem to solve, and with increased production will become a still more vital issue. Those to whom it is of immediate interest should get together and by the introduction of sufficient capital, by interlocking organizations wherein the different towns and cities shall be represented, establish a service that will mean the transport of commodities in less time, at less expense, and, with all, at a profit to all concerned.

A large 6-ton truck bound for Rhode Island from Erving, with 5 or 6 tons of print paper in large rolls, went through the old covered bridge on the Partridgeville Road a short time ago. This road and bridge have been used for the past week or two as a detour for automobiles and teams from Athol to Orange, on account of the railroad bridge being repaired.

The only thing that saved the truck from going into the river were several large beams which caught the machine and held it. A large gang of men from the Highway Department, with a derrick, worked all night to get the machine back into the road.

The Massachusetts State Department of Public Works has let the following contracts for road construction since May 4, 1920:

Thomas & Murphy, Eastham-Wellfleet, bituminous concrete, $166,047.00; M. F. Roache, Falmouth, bituminous concrete, $31,690.20; Hassam Paving Co., Saugus-Lynnfield, Peabody-Danvers, concrete (cement), $211,535.50; Lane Construction Corp., Egremont, bituminous macadam, $39,733.50; Geo. E. Greenough, Acton-Littleton, bituminous macadam, $98,874.00.

The City of Beverly has made general increases in the salaries of city officials including the following: Commissioner of public works $2,700 to $3,200, city engineer from $1,500 to $1,900, clerk of the Public Works Department placed under ordinance and raised from $1,300 to $1,600, city laborers $4 to $4.50.

New York State Road Builders' Association

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Crusher Run

Commissioner Greene recently attended a hearing in Washington before the roads committee of Congress, on the Wadsworth-Hicks Bill, which proposes to raise the Government's allotment on federal aid roads from $20,000 to $30,000 a mile.

A peculiar claim against the state has been filed by Erna Ellis, Palenville, Greene County, for $300 damages for the bombardment of her house by stones caused by dynamite discharge during the construction of a highway running past her farm.

Notice has been served on the Sullivan County Board of Supervisors by Commissioner Greene that unless favorable action is taken on the resolution appropriating the county's share of building the 11½ mi. of federal aid road from Ellenville to Wurtsboro, the mileage will be given to some other county.

Highway construction conditions still remain in the same groove, so there will be no change in the decision of the Commissioner to eliminate the building of new roads this year. The labor market is in worse shape at the present than it was during the war. No new roads will built in any county of the state until conditions become normal.

The New York State Highway Department has put into effect the enforcement of the Ferris amendment to the highway law, relating to the operation of motor trucks and trailers on highways. No truck will be allowed to carry a load greater than 25,000 lb., the load to be distributed so that there will not be over 800 lb. per inch in width of tire of any wheel. A "load meter" will be used in weighing the trucks. Those found overweight will be taken to a checking station, and the drivers placed under arrest.

At the repair contract letting which took place on June 7, 13 bids were received on the 18 roads advertised. The bidding was considered very lively, considering the scarcity of labor and the difficulty of getting materials shipped. The largest contract awarded went to the Schunnemunk Construction Co., of Highland Falls, N. Y., for the repair of Road No. 1271, Orange County, for $170,583.35.

The following were low bidders at the repair contract letting referred to in the foregoing:

Schunnemunk Construction Co., No. 1271, Orange Co., $170,583.35; Schunnemunk Construction Co., No. 1272, Orange Co., $150,423.50; H. J. Mullen Contracting Co., No. 1270, Suffolk Co., $152,407.00; H. J. Mullen Contracting Co., No. 1275, Suffolk Co., $43,884.10; Willite Road Construction Co., Inc., No. 1280, Albany Co., $23,319.50; Harry W. Roberts & Co., No. 1253, Rensselaer Co., $85,207.25; Harry W. Roberts & Co., No. 1246, Jefferson Co., $104,152.48; Arthur F. McConville, No. 1273, St. Lawrence Co., $75,236.00; L. D. Sullivan Co., Inc., No. 1257, Montgomery Co., $48,346.00; Lane Construction Corp., No. 1235, Broome Co., $70,738.10; Holloran Bros., No. 1281, Steuben Co., $36,466.65; Nathan E. Young, No. 1279, Tioga Co., $41,618.40; John W. Gurnett, No. 1276, Chemung, Schuyler, Tioga and Tompkins Counties, $45,243.89; Lathrop, Shea & Henwood Co., No. 1258. Erie Co., $37,660.50.

This makes the fourth contract that has been awarded to Nathan E. Young, of Union, N. Y. Two of his contracts are in Broome County, and two in Tioga County.

Arthur F. McConville, Ogdensburg, N. Y., has been awarded three contracts this year, two of his contracts being in St. Lawrence County, and one in Franklin County.

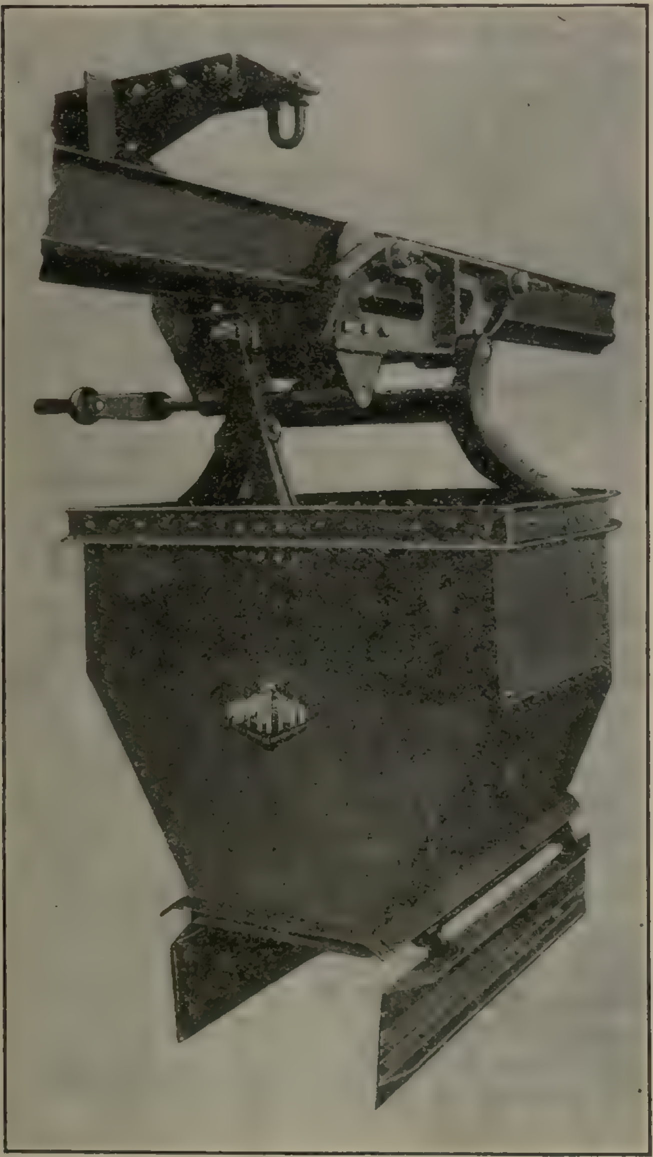
M. A. Terry, New York, N. Y., was awarded the contract for the furnishing and delivering of lignin or sulphite liquor material, f. o. b. cars at destination, for $16,404.50. The other bidder was the Robeson Process Co., its bid being $16,555.00.

A bid of $300,000 more than the engineer's estimate was received for the construction of the 23 piers of the Great Western Gateway Bridge over the Mohawk River at Schenectady, N. Y. The American Pipe & Construction Co., Philadelphia, Pa., were the bidders, their price being $961,000 and the engineer's estimate $663,241.

EQUIPMENT—TRADE—MATERIALS

Mixer Bucket of Special Design

A feature of the Smith "Simplex" high drum type of paver for which special advantages are claimed is the deep, narrow bucket that is used. Because of the height of the drum, the boom has a clearance of 7 ft., thus permiting the use of a bucket of this design. In discharging a mixture stiffer than a flowing concrete the aggregate has a tendency to pyramid, but with this bucket, it is stated, the material can pile on a slope of 45 degrees and yet the bucket will take the entire batch.



DEEP, NARROW BUCKET OF SMITH PAVER

The bucket is equipped with an automatic opening and closing device. As the bucket travels out on the boom, a finger wipes over the contact projections placed 8 in. apart on the under side of the boom. The moment the direction of the bucket is reversed the finger strikes the nearest contact, trips a toggle lock and opens the bottom doors. The bucket continues back to the machine and a slide roller on it strikes a stationary guide on the boom, rides up, and closes the doors.

The paver is manufactured by the T. L. Smith Co., of Chicago, Ill.

Connecticut National Pavements, Incorporated

A Group of Prominent New England Men Incorporate for the Purpose of Constructing National Pavement in Connecticut and Rhode Island

As noted in GOOD ROADS for August 17, 1918, 50,000 sq. yd. of National pavement were first laid in New Haven, Conn., in the year 1917. Some of this pavement was laid on concrete foundation, while some was used to resurface old macadam and old brick pavements. The thickness of the surface was 2 in. The work was done by Alexander Reed and W. A. Strothers, as the Franklin Contracting Co., New York City. Previous to this, the Franklin Contracting Co. had laid over 75,000 sq. yd. of National pavement in Paterson, N. J., and surrounding towns.

Attention was first called to this type of pavement in GOOD ROADS of Sept. 2, 1911, at about the time M. A. Popkess took out patents covering the material and process. As described at that time, the material consists of over 80%, by volume, of finely powdered earthy material, from which all moisture has been eliminated by a drying process. The other 20% of the pavement consists of asphaltic binder. The physical condition of the mineral aggregate is such that the use of soft asphalt is permitted without danger that the pavement will bleed in hot weather or be affected by extreme cold. The pavement has been most strongly indorsed by leading engineers and road builders.

While the pavement has been laid with great success in other parts of the country, it was its satisfactory record in New Haven under the severe traffic of the past few years that attracted the attention of the New England men, the result being the formation of Connecticut National Pavements, Inc. The organization of the new corporation and its strong personnel of officers and directors augur well for the future construction of improved roads and pavements in the States of Connecticut and Rhode Island.

The following are the officers, directors and principal shareholders:

Chairman of the Board, E. G. Stoddard, President, New Haven Bank; President, Union & Fowler Horse Nail Co. President, Julius G. Day, President, Hard

Rubber Goods Mfg. Co., New Haven; President. New England Box Co., Greenfield, Conn. Secretary and Treasurer, Stephen Whitney, capitalist. Vice President and General Manager, Frederick L. Ford, Former City Engineer of New Haven.

Carlos F. Stoddard, Director; Secretary, Winslow, Day & Stoddard, bankers. George M. Gunn, Director; President, Tradesman National Bank, New Haven. Irving H. Chase, President, Waterbury Clock Co.; President, Ingersoll Watch Co. C. H. Nettleton, President, New Haven Gas Co.; President, Derby Gas Co. Bruce Fenn, Director, Sargent & Co. Henry L. Hotchkiss, Director, U. S. Rubber Co. Henry Brewer, Director, Winchester Repeating Arms Co. Victor M. Tyler, Director, Acme Wire Co. Jas. E. Hubinger, President, Elastic Starch Co., New Haven. E. Kent Hubbard, President, Manufacturers' Association, Middleton, Mass. Harris Whittemore, President, Malleable Iron Co., Waterbury. John S. Garvan, President, P. Garvan Co., Hartford. Edward Balf, contractor, Hartford. Frank L. Stiles, brick manufacturer, New Haven. John T. Manson, President, First National Bank, New Haven. Jas. S. Hemingway, President, New Haven Savings Bank. Leon Broadhurst, President, Phoenix Bank, Hartford. John B. Carrington, President, National Savings Bank, New Haven.

Bureau of Standards Studies Effect of Finely Ground Cement in Concrete

Tests conducted by the U. S. Bureau of Standards with normally and finely ground cement of the same brand have been reported and it is shown by these tests that the fineness of the cement bears an important relation to the strength of the resulting concrete. Cement of two degrees of fineness was tested in 1:1½:2, 1:2:4, and 1:3:6 concretes of two consistencies, as well as in a neat mix, and in a 1:3 standard sand mortar. The following results were obtained:

The strengths of concrete made of the fine cement were regularly and consistently greater than those made with the normal cement as far as the tests have been completed.

The percentage increases in strength of the fine cement concretes over the normal cement concretes for different periods were:

	2 da.	7 da.	28 da.	3 mo.	6 mo.
Minimum	90	50	30	21	14
Average	121	66	56	41	42

It should be noted that the difference in fineness between the two cements was 12% and to obtain the per cent. increase in strength for each per cent. in fineness, the figures in the above table showing the increase should be multiplied by 12. The normally ground cement had 86% passing the 200-mesh screen as compared with 98% for the finely ground material.

These percentage increases were highest at the earliest ages and leanest mixes.

The strength increases in pound per square inch of fine over normal cement concrete were greater in the mixes containing the greater proportions of cement.

If the two cements had been used on a job, the following approximate mix proportions could have been used to give the same strength at 28 days, if consistencies and aggre grates were the same:

Using Normal Cement	Using Fine Cement	Approximate Saving In Bags of Cement Per Cu. Yd.
1:3½	1:5	2.1
1:4½	1:6	1.5
1:6	1:8	1.2

(Proportions were one part of cement to sum of volumes of of sand and gravel measures separately.)

When used in 1:3 mortar, the fine cement produced a more marked percentage increase than when used in the concretes. The percentage increases in the neat mixture, however, were of the same order as in the concretes. Thus, in the cases of cements tested, the results of the work on neat cements gave a better indication of their value in concrete than tests in a 1:3 Ottawa sand mortar.

In most cases the fine cement required no more water than the normal cement to produce a given consistency, when the aggregates and mix were the same.

It was found that when the special cement was tested for fineness on the 200-mesh screen, the lumps of very fine material were not broken up under the sieving action and would not pass through the meshes, but when this cement was tested by the air analyser these lumps were broken up and the results thus secured gave a true indication of the fineness of the cement. It is, therefore, recommended that the air analyser be used in determining the fineness of very fine cement whenever possible, but if this can not be done care should be taken to determine this balling on the 200-mesh screen if the determination is made in the usual manner.

"All Presidential Candidates are For Good Roads"

An attractive booklet bearing the above title has been circulated by the Goodrich Travel and Transport Bureau. The portraits of nine presidential aspirants are reproduced, accompanied by statements made by the men relative to the value and importance of good roads. While all emphasize the importance of improved highways, the views of one in particular are of interest, in view of the fact that he, Warren G. Harding, has been nominated for president by one of the leading political parties.

"Transportation has made every avenue of civilization," says Mr. Harding. "Human progress is reflected in the economic welfare of the people of highest civilization and there is no advancement in production and exchange until there are highways to facilitate the transportation involved. We shall notably enhance the advantages of American production when we add to the convenience of transportation through the construction of highways suited to the use of modern motor vehicles. It is the one agency of putting every community in the Republic on the map of commercial relationship."

The Good Roads Corporation of Kansas City, Mo., is the successor of the Good Roads Company, which has been entirely reorganized, refinanced and placed under new management. This corporation manufactures road oilers and tar and asphalt spreaders. M.

C. Boyd, as noted in the April 28 issue of GOOD ROADS, is general manager and treasurer.

The Easton Car & Construction Co. has moved its general offices from 30 Church St., New York, N. Y., to larger quarters at 50 Church St.

The Ingersoll-Rand Company of Illinois and the A. P. Cameron Steam Pump Works, Chicago Branch, have announced a change of address, their new offices being 709 Fisher Bldg., Chicago, Ill.

"Bite, Bite, Bite," is the title of a recent circular on clamshell buckets issued by the Lakewood Engineering Co., of Cleveland, O. It is pointed out in this circular that the bucket that will bite away material the fastest is the most economical to use.

The Ohio State Highway Department has included Kentucky rock asphalt in specifications for pavements, following observations of an experimental road which has been down ten years. The section of this road paved with Kentucky rock asphalt, it is reported, is in excellent condition notwithstanding the fact no maintenance work has been done upon it.

A circular describing jaw crushers and screening machinery manufactured by the Gruendler Patent Crusher and Pulverizer Co., St. Louis, Mo., has recently been issued by that company. The crushers may be placed on either stationary or portable mountings and are built in capacities from ¼ to 30 tons of ordinary limestone per hour, varying according to size of machine and product.

A circular has been recently issued by the Lakewood Engineering Co., Cleveland, O., describing its loading and unloading equipment, in which it is pointed out that freight cars, loaded or empty, are rolling in trains only 9.03% of the time and that 22.54% of the time is consumed in loading and unloading. From these figures it is estimated that an hour per day saved on each car would be equivalent to 102,000 additional freight cars.

Federal Participation in Road Construction

(Continued from page 314)

completed for the improvement of 50 others aggregating 946 mi.

One of the benefits resulting from federal participation in road construction is the firm establishment in all the states of highway departments directed by men trained and experienced in the act, authorized and empowered to immediately expend large aggregates of funds upon road systems laid out and designed for the benefit of the state and its local communities, yet at the same time coordinating with similar systems in neighboring states and thus, united, comprising an interstate system.

The experiences during the war had crystallized public sentiment in favor of an improved system of highways to supplement the transportation facilities afforded by the railroads of the country. That the public is generally supporting a greatly enlarged program of highway construction is evidenced by the large aggregate of bond issues authorized and approved by the vote of the people. The tests of the state highway departments and the federal bureau will come in so administering the expenditure of these sums that the confidence of the public will be justified.

Experience has taught the public to demand that the roads shall be "substantial in character;" therefore, the main thing is to build a road that will stand the traffic in the particular section of the country where it is constructed. The conditions in certain regions may require a heavy, comparatively high cost type of road, while in others a lower cost type may meet all the requirements. Sentiment is growing throughout the country, even in the newer sections, in favor of more substantial roads. The people are beginning to realize that the expense of maintaining the lighter types under heavy traffic is unbearable. They are providing funds for the execution of their ideals and it is for us to see these funds wisely and judiciously expended. It is apparent that the whole highway program has passed beyond the propaganda stage and that there is now the greatest possible need for the highway organizations to produce roads rapidly but without extravagance and without loss of faith on the part of the people. It seems clear that the limiting factors in this large road building program will be the transportation and production of suitable road materials, the contractors' organizations available, and the labor supply.

———000———

A Road from Whiting, N. J., to Toms River and other towns along the New Jersey Coast will be constructed, following the line of the Pennsylvania Railroad. The road will be of gravel.

Richland County, Louisiana, has sold $975,000 of road bonds, at par and accrued interest, the purchaser making deferred payments so that the gratuitous use of the bonds averages 40 months.

The Pennsylvania State Highway Department has approximately 1,000 mi. of highway under construction. Much of this is on the main traveled highways and about 150 detours are in effect in the state.

MEETINGS

Calendar of Coming Meetings

June 29-July 2.—Society for the Promotion of Engineering Education.—Twenty-eighth annual meeting. University of Michigan, Ann Arbor, Mich. Secretary, F. L. Bishop, University of Pittsburgh, Pittsburgh, Pa.

July 6-8—Conference of Mayors and Other City Officials of the State of New York—Annual Conference, Jamestown, N. Y. Secretary, William P. Capes, 25 Washington Ave. Albany, N. Y.

Oct. 12-15—American Society of Municipal Improvements.—Annual Convention, St. Louis, Mo. Secretary, Charles Carroll Brown, 404 Lincoln Ave., Valparaiso, Ind.

Motor Truck Haulers Will Meet to Form National Association

Representatives of motor trucking firms from all parts of the United States will hold a conference in the Hotel La Salle, Chicago, Ill., on June 26 and 27 to organize a national association to deal with the problems which have arisen in the development of long distance hauling.

Among the problems which will be considered will be the construction of highways suited to carry heavy loads, operating costs and equalization of loads and cooperation between commercial haulers in different cities so as to eliminate the empty back-haul.

Police Lieutenant Daniel A. Sylvester, President of the National Traffic Officers' Association, and in charge of traffic in San Francisco, is making a nation-wide tour to study traffic conditions in the large municipalities. Accompanying Lieutenant Sylvester is C. De Witt De Mar, legislative representative of the California Automobile Trade Association. This tour is preliminary to the convention which will be held by the National Traffic Officers' Association in San Francisco, August 23 to 27, and aims to stimulate interestand cooperation in the various cities.

PUBLICATIONS

STATE OF CONNECTICUT. Annual Report of the Highway Commissioner for the term ending June 32, 1919. Paper 6x9 in., 98 pages and covers. Illustrated.

This report covers only nine months, as the Connecticut General Assembly of 1919 changed the fiscal year of the state from September 30 to June 30. During this period 27.81 mi. of new road were built, bringing the total mileage of state highways to 1,510.83 mi. Work was also started on the construction of the Washington Bridge over the Housatonic River. Besides a number of financial tables in the book, several folded insert tables of statistics are included.

UNIVERSITY OF TEXAS. The Movement for the Reorganization of State Administration. Bulletin No. 1848. Paper, 6x9 in., 80 pages and covers.

The work of the several states in taking governmental organizations designed to function under simple economic and political situations and adapting them to present day needs, is described in this publication. The reorganization of administrative departments is discussed separately for each state. It is found that three methods of procedure have been followed by the states in this work. The most common method has been to appoint a special committee of members of both legislative chambers to conduct an investigation and make recommendations. Another way has been the appointment of an official commission, composed of executive officers or members of the legislature. The third method carries this procedure a step further by authorizing a special committee to employ experts to carry on investigations.

PERSONAL MENTION

Grover A. Blunt has been appointed county engineer of Dubuque County, Iowa.

R. M. Miller has resigned as district road engineer for the Utah Roads Commission.

H. L. Dunn has been appointed superintendent of street construction at Columbus, Ga.

J. S. Myers has resigned as superintendent of highways of Hutchinson County, South Dakota.

J. Y. McClintock has become associated with George R. Newell in the practice of engineering at Rochester, N. Y.

George R. Newell has formed a partnership with J. Y. McClintock for the practice in engineering at Rochester, N. Y.

———ooo———

Madison County, Virginia, has voted a $263,000 bond issue for road improvement.

The City of Chester, Pa., has borrowed $50,000 on promissory notes to finish repairing the pavements in that city. All of the available funds for this work had been exhausted before the completion of the work. Morton Ave. has been closed to permit the Sun Shipbuilding Co. to construct a $3,000,000 drydock at the shipyard. In consideration of the closing of the street, the company will widen and bulkhead two blocks of street.

524 a- 3

GOOD ROADS

CONSTRUCTION TRANSPORTATION MAINTENANCE

PUBLISHED EVERY WEDNESDAY BY
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Dust Preventives & Road Binders

By PREVOST HUBBARD

Chief, Division of Road Materials Tests and Research, United States Office of Public Roads.
Octavo: 416 pages. Cloth Illustrated, $4.00 postpaid.

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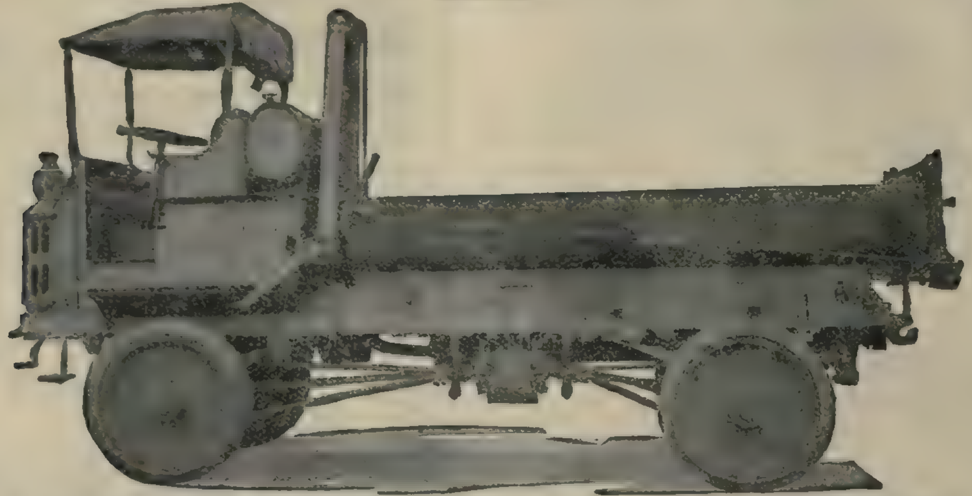

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is so often specified when purchasing road equipment. Its record of successful performance in the past assures you of its ability to serve you satisfactorily and economically in the future. No matter what kind of a truck you are using, the COLUMBIAN LIGHTNING HOIST in connection with a Columbian Steel Dump Body will increase the efficiency of your road building equipment by it's speed, capacity, and ease of operation.

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CONSTRUCTION TRANSPORTATION MAINTENANCE

WITH WHICH IS INCORPORATED

THE HIGHWAY CONTRACTOR AND ROAD BUILDER

Old Series. Vol. LVIII
New Series, Vol. XVIV

JAMESTOWN, N. Y., JUNE 30, 1920

Number
26

Highway Construction in Illinois

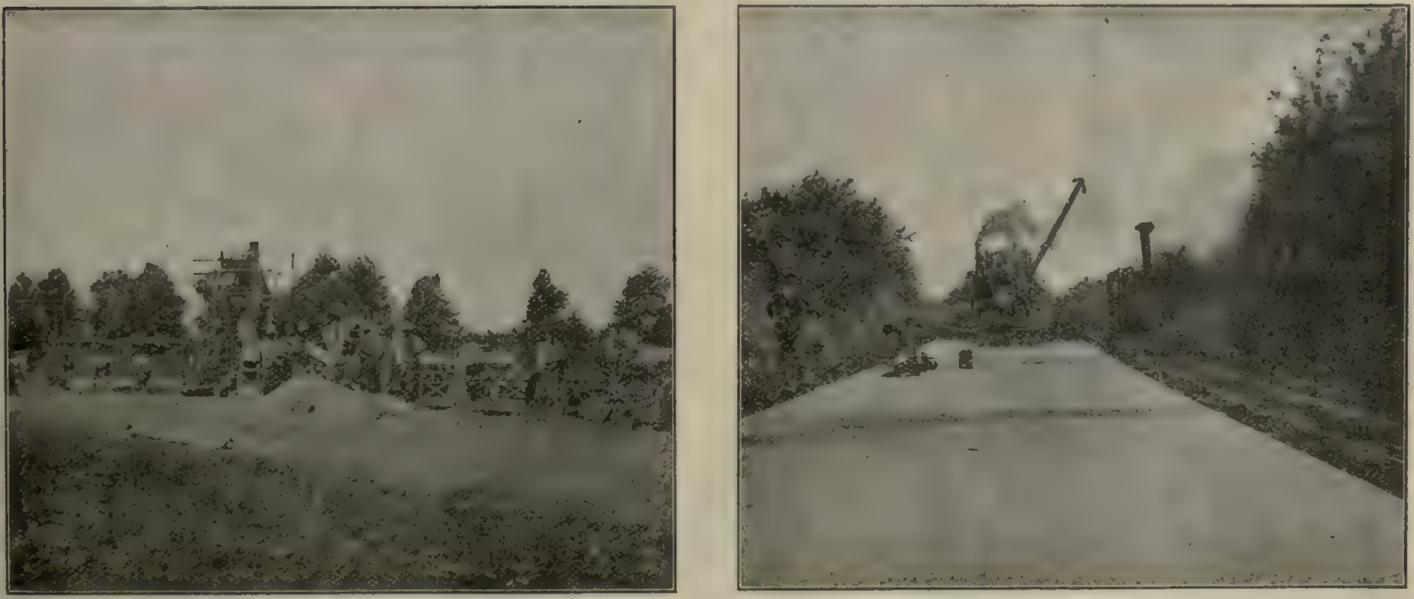
This Season's Construction to Include 400 Miles Carried Over from 1919 and 50 Miles on Contracts Let This Year—This Work Will Complete This Season the State's Federal Aid Road System

By S. E. BRADT*

Approximately 400 mi. of roads involved in contracts awarded in 1919 have been carried over for completion this year. Practically all of these sections carried over are located on the federal aid system. Because of the existing car shortage and the railroad strike, the movement of road materials is being retarded and many contractors are experiencing difficulty in proceeding with construction because of delayed shipments. The State Highway Department is concentrating its efforts to remedy these conditions and it is hoped that construction now under way will be completed this season. Such completion of present construction work will put into service the system of highways planned to be constructed with the aid of federal funds.

Upon the passage of the first federal aid act by Congress, the highway department of Illinois, as were the highway departments of other states, was requested to lay out a system of highways to be improved with the funds thus provided and to forward a map thereof to the Bureau of Public Roads at Washington. The State Highway Commission of Illinois, believing that federal funds should be used in the improvement of such roads as would naturally become federal highways, included in this system:

First, the road which has been designated as the National Old Trails Road, extending from a point near Terre Haute, Ind., through the state of Illinois



Project No. 9—Mixing Operations

Project No. 6—Concrete Pavement

CONSTRUCTION VIEWS ON FEDERAL AID ROAD WORK IN ILLINOIS to St. Louis, Mo., connecting with that same road at both the Indiana and Missouri state lines.

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*Superintendent of Highways, Division of Highways, Department of Public Works and Buildings of Illinois.

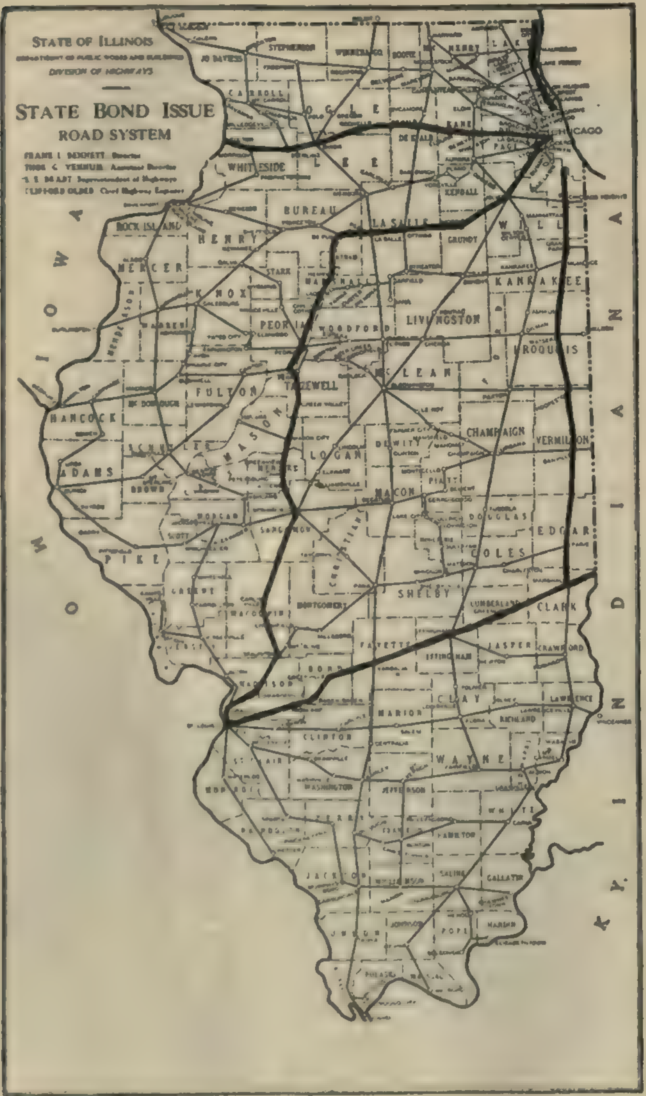
Second, a road extending from Chicago Heights, Cook County, west over the Lincoln Highway to Clinton, Ia., and meeting this national highway at the Indiana and Iowa lines.

Third, the road extending south from Chicago to Danville and thence east to the Indiana line, forming a part of the Dixie Highway, which commences in Michigan and ends at Miami, Fla.

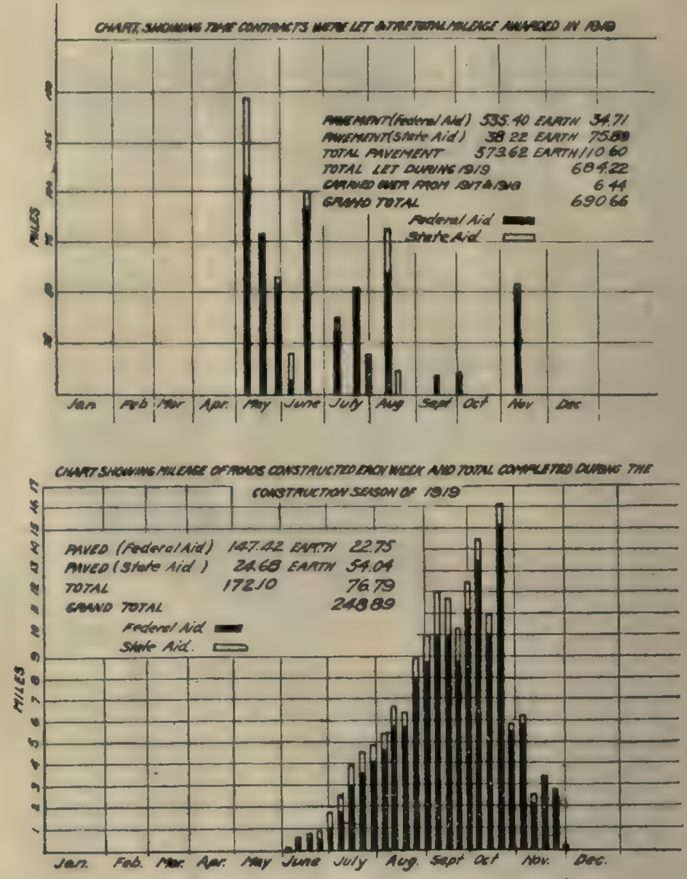
Fourth, the road between Chicago and St. Louis, Mo., connecting the two largest centers of population in the Middle West and forming a link in the northeast and southwest national system.

Fifth, the road running in a northeasterly direction from Chicago to the Wisconsin line and connecting with a road to Milwaukee.

The system of federal aid highways, as shown by the heavy black lines on the map, has a total length of 800 mi. Approximately 200 mi. were improved with a hard surface prior to 1919, either by cities, townships, counties or the state. Last year about 570 mi. of federal aid road roads were contracted for and about 170 mi. completed. Of these contracts, 535.40 mi. called for paving and 34.71 for earth construction. Contracts for over 200 mi. of federal aid roads were awarded in May, 1919, approximately 100 mi. in June, 75 mi. in July, 50 mi. in August, 10 mi. in September, about the same in October, and approximately 50 mi. in November. State aid road construction for 1919 included 38.22 mi. of paved and 78.89 mi. of earth roads.



MAP OF ILLINOIS SHOWING STATE BOND ISSUE ROADS AND HIGHWAYS IN THE FEDERAL AID SYSTEM



PROGRESS CHARTS—SEE TEXT

The accompanying chart showing the rate of construction each day is interesting. Starting in June with an average road construction in the state of less than 1 mi. per day, the rate of construction gradually increased until in October it reached its height, when as large a daily average as 15 mi. of roads was constructed. In the latter part of October road work dropped sharply and in November about 2 mi. of road were constructed, on an average, per day before operations were suspended.

Because of the situation which exists in 1920, contracts for but 50 mi. of pavement have been awarded. All these projects are located on the federal system and fill gaps left from last year. These will be completed, in addition to the 400 mi. left over from last year. Accordingly, it is expected that the entire federal aid road system in Illinois will be placed in service by the end of the present year, providing the

(Continued on page 332)

Road Machinery*

By ARTHUR H. BLANCHARD†

Under the general title of "Road Machinery" will be discussed the various machines used in grading operations and in the construction and maintenance of earth, sand-clay, gravel and broken stone roads.

The purchase of an ideal road machinery equipment will be justified, and is usually advisable, if the work is to be extensive in character. As a fundamental economic principle, maximum use should be made of time and labor saving machinery, due especially to the high cost and scarcity of common, as well as skilled, labor.

Before purchasing a special type of machine, which has been designed with a viewpoint of reducing to a minimum the cost of a certain class of grading or construction, the probable scope of work to be carried on by a department or contractor should be analyzed to determine if the amount of one kind of grading work or construction will warrant the purchase of the special machine, or if, in the long run, such work should not be done with more ordinary types of machines at a slight increase in cost

Depreciation charges on plant equipment always should be given careful consideration prior to the purchase of machines and accessories, as well as in estimating the cost of highway work. The larger types of grading machinery usually must be used for a considerable percentage of the working season, as otherwise such overhead charges as interest on first cost, cost of housing or storage, painting, etc., will be prohibitively high when applied to the cost of a unit of grading on a given piece of work.

If an organization does not include men who are specialists in the manipulation of complicated machinery, or if skilled labor is not economically available, simplicity of machines and ease of manipulation should be given great weight in the selection of equipment. For example, common labor may efficiently perform grading work with scrapers, shovels, wagons, etc., while skilled labor will be required to operate a steam shovel or an elevating or traction grader. Again, graders may be hauled by animals driven by ordinary labor, while, if traction engines are employed, skilled labor must be utilized.

The following paragraphs will be devoted to brief descriptions of the various machines used in grading operations and in the construction and maintenance of roads; methods of operation; and comments pertaining to their efficient use.

Carts and Wagons.—A one-horse tip-cart is generally built with two wheels, the body of which tips over the axle in discharging its contents. The bodies, without side-boards, have a capacity of about 21 to 24 cu. ft. Two-horse tip-carts are operated on the same principle, but are built on 4 wheels and hold about 1½ cu. yd. of material. Patent bottom dump-wagons are made in 1, 1½, 2, 2½, and 3 cu. yd. sizes. The bottom of the wagon is made up generally of 2 leaves, hinged either to the sides or to the ends of the box. The doors are held in place with chains which are wound up on a windlass, operated by the driver. To dump the load, the driver with his foot kicks a release lever and the doors fly open, thus discharging the load. The doors are closed by the driver turning the windlass. While the body of the wagon is generally made of wood, the bottom doors are sometimes made of wood and sometimes of sheet iron. One of the doors is usually provided with a lip, which overlaps the joint formed by the doors, and thus prevents the material from sifting through.

Plows.—The grading plow is so made that a furrow may be turned over to the left or to the right. An ordinary grading plow will make a furrow about 10 in. wide and from 6 to 10 in. deep. For breaking up hardpan, or other stiff material, a rooter plow is employed. A plow of this kind is generally pulled by a steam roller or a tractor.

Drag Scrapers.—A drag scraper consists of a pressed steel bowl to which a bail and handles are attached. They have capacities from 3 to 12 cu. ft. This form of scraper wears out rapidly on its cutting edge and on the bottom, particularly when working in hard-pan or gravel. A drag scraper is usually drawn by one or two horses. To load, a man grasps the handles and pushes the cutting edge into the loosened earth as the scraper is pulled along. Then the full scraper is dragged along on its bottom to the point of dump, where either the driver or a dump man takes hold of one or both of the handles and lifts the scraper so that it turns upside down about its cutting edge.

Wheel Scrapers.—A wheel scraper is similar in shape to a drag scraper, but the bowl is fixed to two wheels, fitted with a pole, and is usually drawn by two horses. They have capacities of 9 to 18 cu. ft. Scrapers with 4 wheels are also manufactured. A wheel scraper is operated as follows: As it is pulled through the plowed material in its lowered position, a man grasps the small handles at the rear of the bowl and tilts the bowl so that the cutting edge engages the earth. When the scraper is full, he pulls down on the long lever at the rear, which raises the bowl from the ground.

Buck Scrapers.—This type of scraper is also known as a Fresno grader. It consists of a bowl or scoop resting on runners. It is generally drawn by 4 horses and loads and dumps in the same manner as described for wheel and drag scrapers except that it rests on runners while being dragged into position for reloading.

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*Paper presented at the 7th annual convention of the Canadian Good Roads Association, Winnipeg, Man., June 1-3, 1920.

†Professor of Highway Engineering, University of Michigan.

In ordinary grading operations, drag scrapers have been used for lengths of haul up to 200 ft.; wheel scrapers for hauls between 200 and 600 ft.; and for lengths of haul above 600 ft., wagons have been employed.

Road Graders.—The 4-wheel machines have blades from 7 to 8 ft. long made up of two parts, a cutting edge and a mold board. By turning large wheels located above the operating platform, the blades may be tilted at any desired vertical or horizontal angle. In using a road grader, a cut is first made at the edge of the ditch, using the point of the blade. On the next round the blade is lowered to a flatter angle and the earth is moved along the blade to the center of the road. By making several rounds with the grader in this manner, the roadbed is crowned at the center. To smooth out the roadbed, the surface is first thoroughly harrowed to break up the large lumps and then the grader is drawn along the road with the blades set at right angles to the center line of the road.

Elevating Graders.—The principal parts of the elevating grader are the plow, mold board and the elevating belt. The mold board back of the plow is shaped so as to deliver the furrow of earth to the elevating belt with as little loss as possible. For heavy work the grader requires 12 horses, 2 drivers and 2 operators on the machine, who operate the various levers controlling the movements of the plow and belt. In many cases a traction engine is used in place of horses. The grader, as it moves along, plows up the earth, which is thrown onto the elevating belt and discharged over its end, either onto the road or into wagons.

Steam Shovels.—A portable revolving steam shovel has proved very efficient in highway grading operations. This type of steam shovel has been used for excavating earth, hard-pan and small boulders. It may be used on cuts varying from 6 in. to many feet. It is generally employed to excavate and load material into wagons.

Road Drags.—These machines are used for finishing the surface of subgrades, earth, sand-clay and gravel roads, and for the maintenance of the types of roads mentioned. One of the simplest and cheapest forms of road drags is the split-log drag. It is a home-made tool, but is extremely useful in maintaining an earth road, and is today preferred by many to the steel drag. A dry red cedar log is best, although red elm, walnut, box elder, soft maple, and willow make good drags when thoroughly dry. A log should be from 7 to 8 ft. in length and from 10 to 12 in. in diameter. The log is split as nearly in half as is practicable, and the heaviest and best slab is used for the front log. The logs are braced together. The diagonal brace at the end runs from the middle of the back log to within 1 in. of the bottom of the front log. An iron strip is fixed at the ditch end. It projects ½ in. below the lower edge of the slab at its outermost extremity and is flush with the slab at its other end. If the front log stands plumb on the face, the iron strip may be wedged out, or if the log has a wind in its, this may be taken advantage of in giving the iron strip a pitch. A platform of 1 in. boards is placed over the cross braces, on which the driver stands. The boards of the platform are fixed about 1 in. apart to allow any dirt that comes onto the platform to sift through onto the road again. The chain is put through the middle of the log at the ditch end and passed over the top of the log at its other end and fastened to the brace. This allows the dirt to pass underneath the chain as it runs from the ditch along the log to the center of the road.

A plank-log drag is built in a similar manner to the split-log drag, except planks set on edge are used in place of the split logs, the planks used being 10 to 12 in. wide and 2 to 4 in. thick. Lap-plank drags are used for smoothing up a road where only a small amount of material is to be moved.

Various forms of steel road drags are now manufactured, which have about the same over-all dimensions as the split-log drag, described above, the logs or planks being replaced by angle irons or steel plates placed on edge. They weigh considerably more than split-log or plank drags, and for this reason are not preferred by some. Steel drags are often equipped with a lever by means of which the blades can be tilted at any desired angle. Some steel drags are made with three parallel blades instead of two and provided with braces, which, when the drag is turned upside down, serve as runners on which it may be drawn from point to point.

In operating a road drag, a team is hitched to the chain so that the drag will be pulled along the road without a load at an angle of about 45 deg. with the center line, the ditch end always being ahead. If it is desired to make the drag cut deeper, the chain should be lengthened, as it is obvious that the nearer the team is to the drag, the more the tendency to lift it from the ground. The driver generally stands on the drag when working and by shifting his weight from one end to the other causes the drag to cut into the soil or to drop the soil being carried along by it. To cut he shifts his weight mostly on the front runner towards the ditching end; to cut light he shifts his weight towards the rear runner; to drop the earth carried along into a depression, he suddenly shifts his weight to the rear and towards the end of the drag nearest the center of the road. Some of the steel drags are so heavy that they cannot be operated in this manner, and hence are not so adaptable to the work.

Rollers.—Horse, steam and gasoline rollers are employed for the compaction of embankments and roads of earth, sand-clay, gravel and broken stone.

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Training the Personnel for Highway Construction and Transport*

By R. D. CHAPIN†

No more far reaching influence has made itself felt in education in modern years than the World War. Hardly had the struggle begun when the importance of training in practical work came to be clearly understood and at once there was a demand for skilled men that was beyond anything in our past history.

Now that peace has returned, we find that the colleges of the United States are all engaged in getting their ships into order after the storm. The war demonstrated that courses which had served while the sailing was smooth, were not of the greatest efficiency, and today there is a movement throughout the land to revise curricula and to shape courses in study so that they will meet with the particular needs of the student who has planned to go into business life.

As one of the great subjects which was developed by the war, and which must be continued in our colleges in the future, if the full effects of economic transportation are to be realized, we have highway transportation. Before America's participation, the motor truck had been looked upon as a vehicle for use in intra-city communication but had not been seriously considered as a unit in transportation. The demands of war changed that viewpoint almost over night. As the railroads became congested, there came an insistent demand for supplementary transportation and the motor truck answered the call. Hundreds of thousands of men were suddnely drafted into service as motor truck operators, convoy leaders and mechanics. Across the seas the arrival of hundreds of motor trucks loaded with soldiers and materials saved the cause of the allies at Verdun. In this country the motor truck became one of the three great factors in the trinity of transportation over the highways, waterways and railways. Perhaps the first evidences of this which were seen were long trains of motor truck convoys traveling from inland ports to Baltimore to handle emergency war supplies which the railroads were unable to take care of. The next step was the sudden coming into life of rural motor express lines. Every ounce of food was needed. The rural express went from farm to farm, picked up the produce for which the farmer had neither labor nor material to transport and swelled the volume of food for those on this side as well as on the other.

Intercity fleet lines came into existence. Where in past years it had been customary for the roads to be used for a radius of some 8 or 9 mi. daily, since the horse was limited to that extent, operators driving the motor units of transportation found that they could take thousands of tons of supplies from city to city, with the result that our highways became a network of transportation systems all engaged in supplementing the traffic haulage of the railroads.

The day of fighting is passed, but from this intensive effort has come a permanent addition to the transportation of the country, whether it be freight or passenger in nature. No longer is the motor vehicle looked upon as an instrument of pleasure. Its place in the economic fabric of the country has become fully understood and its future is one which must surely have a tremendous, far reaching influence in the lives of the people of the country.

To show how far we have progressed, it is only necessary to make a statement that 30,000,000 people ride in automobiles in the United States each day in the year. To some these figures will seem extravagant, but we have practically 8,000,000 motor vehicles in the United States today and we are adding to that number by the hundreds of thousands each month. It is not too much to say that each machine carries four passengers a day. To supplement this, we may note that last year 1,000,000,000 tons of freight were hauled by the motor trucks of the country as against, 90,000,000 tons carried on the Great Lakes and the Mississippi and 2,504,000,000 moved by the railroads.

Now, in all of this great new transportation development there appears a pressing need for highway transportation engineers, men skilled in production and operation of these transportation units. It is necessary that we should have these men by the thousands if we are to save waste in this great new development and to secure the maximum benefit which we should receive.

In order to handle this subject intelligently, it is necessary that it should be coordinated with other forms of transportation, since only through coordination can we hope to obtain the greatest efficiency in the use of each unit. We know that the motor truck is not capable today of competing with the railroad in the long haul. We know that under certain limitations it can serve to relieve the railroads. We should have men trained in the analysis of these problems, able to tell us what the definite economic limitations are.

With the increasing use of highway transportation our traffic problems are becoming acute. In the larger cities as well as in the smaller we find a growing need for definite, well laid out plans for the operation of motor vehicles.

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*Paper presented at the conference on vocational instruction in highway transportation and highway engineering held under the auspices of the Bureau of Education of the U. S. Department of the Interior, Washington, D. C., May 14-15, 1920.

†President, Hudson Motor Car Co., and Chairman, Highways Committee, National Automobile Chamber of Commerce.

There is a further need for close cooperation between the men who are using the highways and the men who are building them. Their problems in many subjects are mutual. The highway transportation engineer brings to the knowledge of the highway engineer a vision as to the future use of highways. He knows something of the trend of production and of the character and type of vehicles which will travel over the roads of the future.

His knowledge should be of definite value to the highway engineer, since in the last analysis road expenditure can only be justified by the volume of the traffic which goes over the completed highways. It is not enough to say that we will build a road. We should know what the future traffic will be once that road is completed and on our vision of the future we should determine the type of highway which is to be built. In other words, I should say that road building is now an econoimc problem first of all. Location of the highway should be undertaken only with due respect to the tonnage which may be developed along the road or to the character of passenger travel which may go that way.

There are hundreds of millions of dollars available for road building in the United States today. The people of the country have shown their belief in the future of highway transportation by the readiness with which they have voted these large sums. Perhaps no other issue before the country meets with the enthusiastic reception which this one does. It is only necessary now that in the future conduct of our highway program we shall seek to avoid any waste and to give to the taxpayer a dollar of value for every dollar expended. The roads which we build must last for the life of the bonds voted to cover the cost of their construction. If they do not, then the future will see a reaction against road construction, which is unthinkable. The only way in which this waste can be avoided is through the treatment of this subject as one which requires highly trained men. There must always be waste when the expenditure of money is left in the hands of men who are selected to perform that function by reason of political patronage rather than their trained knowledge.

We must go further. There is an imperative need for the widest kind of research work. I doubt if there is any man in the United States, skilled though he may be, who can define what character of road should be constructed to withstand the traffic ten years from now. The tremendous growth of motor transportation has outstripped our scientific knowledge, just as it has outstripped our legal procedure—even administration procedure in our automobile factories in some instances.

It is time now that we checked up on the work which we are doing. We should not proceed to spend these hundreds of millions of dollars without knowing in what direction we are going or what results we are to obtain. The colleges and schools should heed this well, as it is the people's money which builds the roads and it is the people who support the schools and colleges and who are vitally interested in both of these subjects. These problems can be solved and our colleges should aid their solution by the institution of broad courses in highway engineering, increased facilities for research and a broadcast movement to acquaint the public with the high importance of skilled men in this task.

Turning to the transportation phase of my subject, I have intimated that the enormous development in motor transportation has brought about a need for trained men in all of the phases of highway transportation, from the department of research and design down to the operator on the road. Glancing over the field it will be found that trained men are lacking. We have simply not had the time as yet to develop them and we must rely upon our colleges to undertake this task.

It is true in the automobile industry, as it is in other industries, that whenever a man is able to perform his duties well, salary becomes a secondary matter from the standpoint of the manufacturer. There is an unlimited field for the ambitious man, properly trained, who enters the automobile industry.

The subject is a popular one. It takes to itself all the glamour and romance which in another day and another generation led the student to take up the subject of railroad transportation. The boy who goes into the field of highway transportation, whether he goes in as engaged in the production and use of the vehicle or as one engaged in the construction of the road, becomes an intimate part of the life not only of his community but of his state and of the nation. He is doing more than earning a mere living. He is making it possible for others to obtain more from life since upon the adequacy of our transportation facilities rests, in a large measure, the breadth of life of all of us.

The subject is one which is bound to increase in importance. There are 8,000,000 automobiles in use in the United States today. Each year sees the number increasing by the millions. Except in Europe, the use of the motor vehicle has been largely restricted in other countries. Lack of appreciation, lack of funds, lack of highways, have been responsible. Today we see a changed condition abroad. More and more automobiles are being demanded from this country. Last year our export showed an increase of 79%. In the years to come we may expect to see broad highways driven into the heart of old Europe, Asia and Africa, opening potential resources almost beyond the vision of any of us present. All this means that there will be an ever increasing field of usefulness, both in the engineering and highway transportation fields.

The subject is one which reaches so closely into

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GOOD ROADS
CONSTRUCTION TRANSPORTATION MAINTENANCE

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Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

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Vol. XVIV JUNE 30, 1920 No. 26

COOPERATION BETWEEN ROAD USERS AND ROAD BUILDERS

A point that can hardly be emphasized too strongly was made in an address by R. D. Chapin, the former chairman of the Highways Transport Committee, which is printed on other pages of this issue. He said:

"There is a further need for close cooperation between the men who are using the highways and the men who are building them. Their problems in many subjects are mutual. The highway transportation engineer brings to the knowledge of the highway engineer a vision as to the future use of highways. He knows something of the trend of production and of the character and type of vehicles which will travel over the roads of the future."

This is merely another way of expressing a thought that has been presented many times in this column—that roads must be looked at not as something apart, but as a means to an end, that end being the transportation of passengers and freight. They are exactly like the tracks of a railroad system, which would be useless without the rolling stock. And just as the construction of railroad track has been developed to meet the development of locomotives and cars, so must the building of highways be carried on with the sole object of providing for highway transportation.

In this work, the highway engineer occupies a place very like that occupied by the railroad engineer whose duties are in the maintenance of way department. His work is vital to the functioning of the system, but it would amount to nothing without the cooperation of the men in the operating department.

BRIDGE ENGINEERS AT FROM $25 to $52 A WEEK

Salaries paid highway engineers have been discussed in this column on several occasions, the issue of last week being the most recent. A concrete example of the inadequacy of the remuneration of one branch of that profession is furnished by the notice of examinations for bridge engineers in Government service that was also printed in that issue.

The positions to be filled are those of "highway bridge engineer" and "junior highway bridge engineer," and the duties, as set forth in the official notice, are "superintending the construction of bridges of various types throughout the United States and cooperating with state highway departments in connection with the provisions of the Federal Aid Road Act. In addition, the duties of appointees will be inspection of bridges and investigation of bridge building materials, administrative organization, methods of management, inspection of bridges locally and giving advice in regard to their improvement, etc. The work will also include making surveys of bridge sites, design and preparation of plans for bridges, and the review of plans and specifications."

Competitors are to be rated on education, experience and fitness. Applicants for the position of junior highway bridge engineer must have had "at least six years of preliminary experience in civil engineering, showing satisfactory advancement and indicating special fitness." The completion of an engineering course is accepted in lieu of this "preliminary" experience, each year counting as 18 months' experience, and "additional credit" is given for undergraduate or postgraduate specialization in bridge engineering. In addition to the four years in an engineering school or the six years' experience applicants must have had at least two years of civil engineering experience subsequent thereto and one year of this must have been in highway bridge engineering.

Note that the foregoing are the qualifications for the junior grade, for which the compensation is from $1,320 to $1,920 a year.

Applicants for the position of highway bridge engineer—the senior grade—must have had the same "preliminary" experience as that specified for the lower grade, that is, six years' experience in civil engineering or its equivalent wholly or partly in a civil engineering course. In addition, they must have had, "at least three years of practical civil engineering experience subsequent to the technical education or experience specified in the first subject, and two years' experience in the direction or performance of important bridge enginering, of which at least one year shall have been in the design of highway bridges."

For those who qualify and are appointed there awaits a salary of from $2,100 to $2,700 a year!

It is to be expected that a large proportion of the applicants for these positions will be men who are graduates from four-year courses in engineering schools. Such men, after spending two years in practice, one of them in highway bridge engineering, may qualify for responsible work, as junior highway bridge engineers, that will bring them from $110 to $160 a month—which is from a bit more than $25 to about $37 a week or a trifle over $4 to a little over $6 a day. When one of these men is "superintending the construction of bridges of various types throughout the Unietd States," he can derive such comfort as is obtainable from the realization that he is about the poorest paid man on the job.

The man who, besides spending time and money to obtain a technical school education, has spent three years in "practical civil engineering experience" and also has had "two years' experience in the direction or performance of important bridge engineering, of which at least one year shall have been in the design of highway bridges," can earn (indeed, will earn) a salary ranging from $175 to $225 a month—almost as much as a skilled laborer whose skill is all manual and who obtained it in half the time the engineer did and was well paid while learning. Reduced to a weekly and daily basis, the pay of this engineer amounts to from a little more than $40 to almost $52 a week or from about $6.75 to about $8.60 a day. While he is superintending the construction of a bridge or is engaged in the "inspection of bridges and investigation of bridge building materials, administrative organization, methods of management, inspection of bridges locally and giving advice in regard to their improvement," or is busy "making surveys of bridge sites, design and preparation of plans for bridges, and the review of plans and specifications," he can —and will—reflect on the relative returns from his investment in education and training and the investment made by the concrete and steel workers on the bridges of which he has charge.

While engineers are paid such salaries as these, is it remarkable that there should be a lack of good men in the public service or that the good men in it should be leaving every day to accept positions with private enterprises or to enter practice for themselves? Under existing conditions of public employment all that a man can hope from it is the making of a reputation that will bring him offers to leave it.

Highway Construction in Illinois

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present shortage of railroad cars does not continue and prevent the delivery of necessary materials to the contractors.

The construction of 1,000 mi. of roads in 1920 in addition to the 800-mi. federal aid system, had been planned, but because of the lack of bidding, car shortage, cement shortage, high price per mile of bids and the unfavorable bond market, it was announced on March 10 that all bids for road construction would be rejected, excepting those mentioned above, which were let to complete the system of federal roads. The $60,000,000 issue of highway bonds will not be drawn upon and will be held until more favorable conditions exist in road building. This bond issue was voted by the people of Illinois in 1918 and the principal and interest are to be paid from motor fees.

Several weeks after it had been decided to postpone the use of the $60,000,000 bond issue, a conference was held between Governor Lowden, Director of the Department of Public Works and Buildings, Frank I. Bennett, Chief Highway Engineer Clifford Older, and the writer. At this conference it was decided that the Division of Highways should proceed as rapidly as possible with the heavy grading and the construction of bridges and culverts on the state bond issue system. In carrying on the highway work even in a prairie state like Illinois, many sections of road are found where unusual fills or cuts are necessary. Whenever such places are encountered it is not deemed expedient to construct a hard surface until the fill has been allowed to stand at least a season to give the earth an opportunity to settle, thus furnishing a solid grade upon which to place the pavement. By doing this work now it will be possible to put the entire system in service a year earlier than if left until contracts are awarded for grading the level sections. The main difficulty in carrying out this program is the possible inability to secure steel for bridge construction, but it is hoped that this can be overcome.

In order to expedite the completion of the system of federal aid roads, a general letter was sent to contractors in January of this year, urging them to place a considerable amount of cement and other road building materials in storage during the spring months. A shortage of cement and a lack of transportation facilities were anticipated, and most of the contractors acted according to this suggestion. Heretofore during the summer months up until August, there have been enough railroad cars, and it was thought that if the contractors could store materials during the early spring months, there would be little difficulty in securing cars for shipments of additional materials during the summer months. However, the problem of transporting sufficient material to the various jobs in the state so that operations will not be delayed is constantly present.

Work of reconnaissance surveys and road location will be carried on by the department. The bond issue law requiries that the exact location of roads between the points named in the law shall be determined by the Department of Public Works and Buildings. It is the policy of the department to hold public hearings after reconnaissance surveys have been made, and all people interested in the location of a route are invited to come to the hearing and present such data and information as they wish. Then the final decision is made by the department and the location of the route made public.

Canadian Contractors Pay 1 Per Cent. Materials Tax

The Inland Revenue Office, Ottawa, Canada, has made the following rulings on the 1% tax imposed on sales by manufacturers as it will affect contractors:

"Contractors and sub-contractors will have to pay 1% tax on manufactured materials used by them. Products of the soil, such as sand, gravel and unprocessed stone are not taxed. Lime, cement and stone which is quarried, crushed or which passes through any process, come under the tax.

"The tax is not chargeable on the amount of the contract, either between the sub-contractor and the contractor or between the contractor and the owner.

"The tax is primarily one upon materials and is not intended to be a tax upon labor. Labor used in the installation of materials is not taxed, but the tax does not apply to labor used in the manufacture of materials."

Road Machinery

(Concluded from page 328)

Horse Rollers.—A hose roller is generally made with one large roller having a face of about 5 ft. and a diameter of about 5 ft. Any weight desired from 2½ to 5½ tons, varying by 1 ton, can be obtained. Additional weight may be placed in the boxes at either end of the frame and the weight be thus increased by 1 ton. The roller is made of steel or cast iron. An essential feature of a horse-drawn roller is to have it reversible, so that it can be drawn in either direction.

Three-wheel Rollers.—Three-wheel rollers vary in weight from 10 to 20 tons. The majority of rollers of this type are run by steam, although there are a few makes which are run by gasoline engines. Rollers are generally furnished with a high and low speed. The low speed is used in rolling embankment, subgrade, telford, etc. while the high speed is used in finishing the surface or in traveling from point to point.

Scarifiers.—These machines consist of a heavy cast iron block on two or four wheels which holds a series of steel picks. The blocks weigh about 3 tons and the picks can be adjusted in the blocks or the blocks themselves arranged so that any depth desired up to 5 or 6 in. can be picked up. The picks are arranged in either a straight line or in two lines which, together, form a V. Most of the scarifiers are so designed that it is not necessary to turn them around. This is accomplished generally by having two sets of picks, one set being used when the machine runs in one direction and the other when in the opposite direction. Scarifiers of this type are towed by a chain hitched to the roller. The arrangement of the picks and the form of the blocks vary, but all of the machines work on the same principle. Scarifiers are of particular value when used in connection with the resurfacing of roadways of gravel or broken stone.

California Road Funds in Litigation

Former Highway Official Would Halt Road Construction in State by Stopping Use Of Federal Aid Funds to Market Bonds

A mandamus suit against the State Controller and State Treasurer of California has been filed in the Sacramento Court of Appeals by W. R. Ellis, former secretary of the California State Highway Commission, which seeks to prevent the use of federal aid road funds in making up a deficit resulting from the sale of state highway bonds in an unfavorable market. A writ of mandate is asked compelling the state treasurer and controller to credit to the state highway road funds, an aggregate of $329,011.82 federal road warrants. If this suit is decided in favor of the plaintiff, the funds involved can not be used in connection with the sale of state highway bonds, and will delay highway work in that state.

Michigan Bond Sale Difficulties

Increase of Interest Rate on Road Bonds from 4½ to 5% Not Sufficient to Effect Sale of $50,000,000 Issue—Residents of Wexford County to Buy Bonds for Roads in that County to Prevent Hold-up of Work

Although Michigan has raised the interest rate from 4½ to 5%, difficulty is being encountered in selling its highway bonds. A bond issue of $50,000,000 for road building was recently voted but the 4½% interest rate failed to attract investors. The Legislature, it is reported, will be asked to raise the legal 5% limit at its next session.

The failure of the state to market its bonds will not halt the road program of Wexford County, for inhabitants of that county have agreed to purchase all the bonds necessary to finance the state's share of trunk line construction in Wexford County and the plan has been approved by the state authorities.

EQUIPMENT—TRADE—MATERIALS

Luten Bridges in Cass County, Indiana

In the northwestern part of Indiana lies Cass County, drained by the Wabash and Eel Riers, which join near the center of the county. The area of the county is about 420 sq. mi., and while high bluffs are found in the vicinity of the rivers, the remainder of the surface is generally flat, running into prairie land in the north and wooded sections in the south.

Three reinforced concrete bridges spanning the Wabash have been erected by Cass County at or near Logansport, the county seat. These structures are of interest in that they combine permanence of construction with beauty of design, the curves and structural elements conforming to the forces involved in a dignified arrangement which represents utility throughout the structures. These bridges were erected by the National Concrete Co., of Indianapolis, Ind., for the Board of Commissioners of Cass County, on design by Daniel B. Luten, Bridge Engineer, Indianapolis, Ind.

The Zimmerman Bridge crosses the Wabash about 5 mi. northeast of Logansport and consists of four reinforced concrete arch spans of 90 to 100 ft. in length, with an 18- ft. roadway. The structure was built in 1916.

The Lewisburg Bridge spans the Wabash at the town of Lewisburg, about 10 mi. from Logansport and consists of five reinforced concrete arches of 83 to 90 ft. in length, with an 18-ft. roadway. This bridge was erected in 1913, and while a country highway bridge, has ornamental concrete railings, polished arch wings and bush-hammered spandrel walls to accentuate the structural elements. A gravel road passes over the structure.

The Third Street Bridge at Logansport has three reinforced concrete arch spans with a 49½-ft. roadway and was constructed in 1913. The middle span is the longest and dominating one, the end spans being shorter with heavy depressed springs at abutments. The roadway is cambered 3 ft., giving increased waterway and improved appearance. A brick roadway for highway traffic and an interurban railway pass over the bridge. The load capacity of roadway is 150 lb. per sq. ft. This structure replaced the steel bridge washed away in the Easter flood in 1913. The high water level for the present bridge is at the lower line of the spandrel coping. The Pennsylvania Railroad tracks at one end and the Wabash Railway subway at the other end restricted further elevation. However, the structure offers but 25% restriction of waterway and will not give rise to a head of more than 1 ft. if the 1913 high water level should recur.

Particular attention has been given to the aesthetic elements in the design of these bridges. The light arches with shallow crowns supported on heavy abutments and slender piers present the appearance of leaping arches, combining at the same time efficiency and strength. Panels are used instead of posts over the crowns and ornamental concrete railings take the place of the conventional gas-pipe. The arch rings and copings are livened by bush-hammering, which produces a contrast with the structural members, augmented by V-grooves separating the two contrasting surfaces. Surface drains prevent the washing away of friable road material and drip grooves across the under surface of the arch ring serve to prevent streaking from seepage.

Stock Subscription Plan of the Firestone Tire & Rubber Company

Under the present stock subscription plan of the Firestone Tire & Rubber Co., of Akron, O., more than 50% of the company's labor turnover is confined to employees who have been with the concern less than one month and more than 90% of the labor turnover is confined to employees of less than six months.

Under the plan of this company, each employee is entitled to subscribe annually to a certain number of shares, according to length of service. In 1919 the allotments were from 1 to 5 shares, although in previous years as high as 10 shares were sold to an employee. The stock bought by employees is unassessable and is sold at par regardless of market price, payments being made in cash or by the deferred payment plan.

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Only One-Half of the $3,000,000 Road Loan Authorized by the Maryland General Assembly is to be floated this year, in accordance with the decision reached at a meeting on June 8 of the Maryland Board of Public Works. This action is taken so as to make available funds to meet federal aid allotments and to use in the construction of lateral highways. The bonds will bear 4½% interest, will be dated August 15, 1920, and bids will be asked shortly before that date.

The Widening of the White Horse Pike, from Camden to Berlin, N. J., has been commenced by the New Jersey State Highway Department. This route is used very extensively by motorists traveling to the numerous coast resorts in that state and several accidents have occurred at the curves at Magnolia and Overbrook. Work has been started at Barrington and is nearing completion on the stretch from Atco to Ancora, where the sharp curve at the Atco bridge will be eliminated.

MEETINGS

Calendar of Coming Meetings

June 29-July 2.—Society for the Promotion of Engineering Education.—Twenty-eighth annual meeting. University of Michigan, Ann Arbor, Mich. Secretary, F. L. Bishop, University of Pittsburgh, Pittsburgh, Pa.

July 6-8—Conference of Mayors and Other City Officials of the State of New York—Annual Conference, Jamestown, N. Y. Secretary, William P. Capes, 25 Washington Ave. Albany, N. Y.

Oct. 12-15—American Society of Municipal Improvements.—Annual Convention, St. Louis, Mo. Secretary, Charles Carroll Brown, 404 Lincoln Ave., Valparaiso, Ind.

Texas Road Builders' Association

The second meeting of the Texas Road Builders' Association was held at the Driskill Hotel, Austin, Texas, on June 23 and 24. This association was organized last February through the activities of the Engineering Department of the University of Texas and the State Highway Department and the first meeting was held in Austin on Feb. 18, 19 and 20.

The program of the second meeting was as follows:

Wednesday, June 23, 9:00 a. m.

Registration of members.

President's address.

Business meeting.

Wednesday, June 23, 2:00 p. m.

"Shell Roads Methods and Cost of Maintenance," by J. M. Howe, County Engineer, Harris County.

"Recent Practice in Concrete Construction," by Chas. A. Clark, District Engineer, Portland Cement Association.

"County Bidding in Their Highway Work," by J. M. Isbell, County Engineer, Wichita County.

Wednesday, June 23, 8:00 p. m.

Motion pictures.

Thursday, June 24, 10:00 a. m.

"Advisability of Establishing State-Owned Cement Mill," by Prof. J. C. Nagle, Dean of Engineering, A. & M. College.

"Highway Construction from Contractor's Point of View," by T. P. McElwrath.

"Contractors' Bonds, Should They be Eliminated?" by R. J. Potts.

Thursday, June 24, 2:00 p. m.

"The Lumber Situation in Texas in its Relation to Good Roads," by Lynch Davidson, State Senator, 16th District.

Michigan Good Roads Association

The program for the annual convention of the Michigan Good Roads Association is now in the course of preparation, with the tentative dates of Aug. 31, Sept. 1 and 2 set for the meeting to be held in Lansing, Mich. It is planned to assign one day to the Michigan State Highway Department.

Canadian Good Roads Association

The seventh annual convention of the Canadian Good Roads Association was held at Winnipeg, Man., on June 1, 2 and 3, with a registration of over 200. The sessions were formally opened on the first day by Sir James Aikens, Lieutenant-Governor of Manitoba, and S. L. Squire, President of the Association. The technical sessions, banquet and annual meeting were held in the Royal Alexandra Hotel.

On Tuesday evening, June 1, the delegates assembled at the Government House, where an excellent musical program was rendered and refreshments served. The annual banquet on Wednesday evening was attended by over 200 delegates and was tendered by the city of Winnipeg. On Thursday evening the annual meeting was held.

Because of the absence of several speakers at the second session, the program as printed in the May 26 issue of Good Roads, was not followed throughout. C. A. Magrath, B. M. Hill, A. Fraser and A. H. Blanchard were unable to attend and addresses were given by Beniah Bowman, Minister of Lands, Forests and Mines, Ontario; S. L. Squire, President of the Association; E. O. Hathaway, District Engineer, U. S. Bureau of Public Roads, and A. W. Campbell, Dominion Highway Commissioner.

At the third session, F. C. Biggs, Minister of Public Works and Highways of the Province of Ontario, presented a paper on "Roads as an Aid to Agriculture;" A. P. Sandles, Secretary of the National Crushed Stone Association, Columbus, O., spoke on "Economical Methods of Transporting Road Materials;" and A. R. Hirst, State Highway Engineer of Wisconsin, presented a paper on "How to Improve Earth, Clay and Sand Roads."

At the fourth session, Col. Wm. D. Sohier, Ex-Chairman of the Massachusetts State Highway Commission, presented a paper on "Bituminous Treatment of Sand Roads;" A. E. Foreman, Chief Engineer, British Columbia Public Works Department, presented a paper on "Organization of Provincial Highways Departments," and a paper received from Geo. Hogarth, Chief Engineer, Ontario Highway Department, on "Broken Stone Roads," was read by a member.

At the fifth session, H. S. Carpenter, Deputy Minister of Highways, Saskatchewan, presented a paper on "Road Maintenance and Dragging;" M. A. Lyons, Chief Engineer, Good Roads Board, Manitoba, read a paper on "Highway Bridges and Culverts," and W. H. Connell, Consulting Engineer, Philadelphia, Pa., read a paper on "Asphaltic Concrete Pavements."

S. J. Latta, Minister of Highways, Saskatchewan, and T. L. Church, Mayor of Toronto, gave addresses on civic subjects at the last session and W. P. Near, City Engineer of St. Catharines, Ont., presented a paper on "Cement Concrete Roads."

At the annual meeting of the association held on Thursday evening, June 3, the following officers were elected; President, A. E. Foreman, Chief Engineer, Public Works Department, British Columbia; First Vice President, Dr. E. M. Desaulniers, Montreal, P. Q.; Second Vice President, S. J. Latta, Minister of Highways, Ontario.

The New Jersey State Association of County Engineers held its quarterly meeting on June 25 and 26 at the Hotel Mannahassett, Seaside Park, N. J.

The Washington Good Roads Association has been formed by residents of Washington County, Minnesota. At a meeting held in Stillwater, R. A. Wilkinson, of St. Elmo, was elected president, Albert Lohman, of St. Elmo, vice president and W. C. Krog, of Stillwater, secretary. The executive committee of the association will consist of the chairman of each town and village organization.

PERSONAL MENTION

L. C. Tetter has been appointed engineer of Riley County, Kansas.

Frank S. Knittle has been appointed city engineer of Casper, Wyo.

R. T. Campbell has been appointed city engineer of Brainerd, Minn.

Homer Hillman was recently appointed engineer of Sherman County, Kansas.

C. E. Donnelly has been appointed assistant city engineer of Kansas City, Mo.

Eugene Prentice has been appointed assistant to the city engineer of Binghamton, N. Y.

L. D. Kelsey, formerly City Engineer of Aberdeen, Ore., is now city engineer of Raymond, Ore.

J. A. Focht, formerly City Engineer of Sweetwater, Texas, has been appointed engineer of Rockwall County, Texas.

A. B. Fletcher, Highway Engineer of the California State Highway Commission, has been appointed a member of the advisory board to the Secretary of Agriculture in matters relating to the administration of the Federal Aid Road Act.

Watson G. Clark, formerly a member of the New Jersey State Highway Commission, has been appointed temporary consulting engineer, with the powers formerly vested in the state highway engineer whose resignation is noted elsewhere in this column. The vacancy caused by the expiration of Mr. Clark's term, in March, has not been filled.

William G. Thompson, State Highway Engineer of New Jersey, has resigned and will enter private practice in New York City. Mr. Thompson served on the engineering staff of Gen. George W. Goethals during the construction of the Panama Canal and came to New Jersey as assistant highway engineer shortly after the appointment of Gen. Goethals as state engineer, during the term of Governor Edge. In 1918 Mr. Thompson succeeded R. A. Meeker as state highway engineer.

Training the Personnel for Highway Construction and Transport

(Concluded from page 330)

the life of the individual that its importance should be impressed upon him at the earliest stage. There is a place for the study in the kindergarten. No child should go through the primary schools without receiving a course in safety first which will give him a full understanding of the rules of the road, whether he lives in the city or in the country.

When we go to the colleges there should be finate outlines which will equip men for the highest type of employment in these fields. In some cases these courses will be found in the engineering schools, but there will always be a need for a number of men trained in business administration, salesmanship and advertising who should have more than a vague understanding of the specialized automobile field.

Special degrees should be given in these subjects by our colleges. The reason is not hard to find. Highway engineering is as important a branch of engineering as is any other specialized form, such as railway engineering. Highway transportation will require more men than railroading.

The task ahead is a large one. It is one of sufficient importance to engage the attention of leaders in the two fields in the United States. The national conference on this subject called by Dr. Claxton, Commissioner of Education, is a milestone in educational progression in the United States which the students of the future will look back to as the beginning of a new era in education of most far reaching importance to themselves and to their children.

CONTRACT NEWS

CONTRACTS PENDING—REPORTED IN PREVIOUS ISSUES*

Date of Letting		See GOOD ROADS Issue of
	ROADS AND STREETS	
6-30	Manistique, Mich. Shaping, draining and gravel surfacing	6-23
6-30	Toronto, Ont. Draining and incedental work	6-23
7- 1	Harrisville, Mich. Shaping, draining and gravel surfacing	6-23
7- 1	Fort Worth, Tex. Concrete paving	6-23
7- 2	Elmore, O. Grading, draining and concrete paving	6-23
7- 2	Washington, Pa. Resurfacing	6-23
7- 3	Tucson, Ariz. Draining and paving	6-23
7- 5	Jasper, Ind. Macadam road	6-23
7- 5	Rensselaer, Ind. Road improvement	6-23
7- 6	Boonville, Ind. Grading, draining, and broken rock paving	6- 9
7- 6	Covington, Ind. Grading, draining and gravel and stone paving	6-23
7- 6	Baltimore, Md. Sheet asphalt paving	6-23
7- 6	Lexington, Miss, Draining and paving	6-23
7- 6	Dallas, Ore. Concrete paving	6- 9
7- 7	Columbus, Ind. Grading, draining gravel and stone paving	6-23
7- 7	Baltimore, Md. Sheet asphalt paving	6- 23
7- 7	Breckenridge, Minn. Clearing, grubbing and draining	6-23
7- 7	Caledonia, Minn. Draining and clay surfacing	6-23
7-12	Fergus Falls, Minn. Grading, draining and clay surfacing	6-23
7-14	Tavares, Fla. Paving	6-23
	BRIDGES	
7- 1	Fort Worth, Tex. Bridges	6-23
7- 3	Tucson, Ariz. Reinforced concrete bridge	6-23
7- 6	Elk Point, S. D. Steel bridge	6-23
7- 6	Hayti, S. D. 5 steel and reinforced concrete bridges	6-16
7- 6	Yankton, S. D. Bridges and culverts	6- 9
7- 7	Caledonia, Minn. Reinforced concrete and portable culverts	6-23
7-12	Hillsboro, O. Concrete bridge	6-23

*Items preceded by ✽ are noted for the first time and are not included in above table.

ROADS AND STREETS

Bids Asked and Prospective Work

Phoenix, Ariz.—It is planned to pave 7 mi. of road between this city and Glendale, Maricopa Co.; estimate $200,000. Address Thos. Maddock, State Engr.

San Bernardino, Cal.—Bids will be received by Bd. of Supvrs. of San Bernardino Co., in July for concrete curbing, paving and culverts on 17,750 ft. of Hellman Ave.

San Diego, Cal.—Bids will be received shortly by Bd. of Supvrs. of San Diego Co., for concrete paving on several roads. J. B. McLees, Co. Clk.

✽**Wilmington, Del.**—Bids will be received by the New Castle County State Highway Comn., Room 133, County Bldg. until noon, July 6, for the construction of alternate types of standard pavement on Sec. No. 5A. Lincoln Highway between Sec. No. 4, Lincoln Highway, near Pike's Creek and the Roseville Bridge. Plans and specifications on file in the office of the Highway Comr., Room 133, County Bldg. Address Charles E. Grubb, New Castle County State Highway Comr.

✽**Thomasville, Ga.**—Bids will be received until July 9, for the construction of the Thomasville-Quitman Rd., Route 38, 7 mi. from the city limits of Thomasville, sand-clay surfacing. Address S. L. Hearald, Clk. of Bd. of Comrs. of Roads and Revenues.

Boise, Idaho—Bids will be received shortly by State Highway Comn., for grading and concrete or bituminous macadam surfacing on 2.7 mi. of road between Beachs Corner and Ucon, Bonneville Co.; estimate, $85,500; also graveling, etc., on 16 mi. of road between Arco and Howe, Butte Co.; estimate, $90,000.

✽**Carbondale, Ill.**—Bids will be received until Aug. 1, for paving streets, estimate, $25,000. Address W. L. Brown, City Clk.

✽**Springfield, Ill.**—Bids will be received by the Dept. of Public Works and Buildings, Div. of Highways, until 10 a. m., July 7, for the construction of state aid road work as follows: Mason Co., Sec. B, Route No. 1, 16-ft. concrete pavement, 3,000 ft.. estimate, $13,091; Lawrence Co., Sec. E, Route No. 7, 10-ft. concrete pavement, 3,226 ft., estimate, $9,854; Shelby Co., Sec. 1, Route No. 5, 16-ft. concrete pavement, 4,000 ft., estimate $20,002; Jo Daviess Co., Sec. G, Route No. 2, 26-ft. earth road, 4,150 ft., estimate, (cement not furnished by Dept.) $7,285; Ford Co., Sec. D, Route No. 1, 10-ft. concrete pavement, 4,400 ft., estimate. $13,195. Address Clifford Older, Chief Highway Engr.

Bids will be received by the Dept. of Public Works and Buildings, Div. of Highways, until 10 a. m., July 7, for grading Vandalia-Cario Highway, Project No. 14, sections, counties, widths. length, and approximate yardages of excavation as follows: Sec. 24A, Fayette Co., 30 ft., 0.94 mi., 12,400 cu. yd.; Sec. 25A, Fayette Co., 30 ft., 1.26 mi., 28,800 cu. yd. (cement furnished by Dept.); Sec. 26A Marion Co., 30 ft., 0.79 mi., 7,100 cu. yd.; Sec. 27A, Marion Co., 30 ft., 1.52 mi., 34,700 cu. yd. (cement furnished by Dept.); Sec. 28A, Marion Co., 30 ft. 0.53 mi., 8,940 cu. yd.; Sec. 29A, Marion Co., 30 ft., 0.61 mi., 21,200 cu. yd.; Sec. 30A, Marion and Washington Co., 30 and 19 ft., 2.39 mi., 20,500 cu. yd., (cement furnished by Dept.); Sec. 33A, Washington Cos., 30 ft., 0.75 mi., 8,400 cu. yd.; Sec. 32A, Washington Co., 30 and 19 ft., 2.39 mi., 20,500 cu. yd., yd. Plans and specifications on file in the offices of C. M. Hathaway, Record Bldg., Effingham, and L. Schwartz, Brush Bldg., Carbondale, Address Clifford Older, Chief Highway Engr.

✽**Bloomfield, Ind.**—Bids will be received by the Co. Aud. of Green Co., until 2 p. m., July 6, for the construction of macadamized road in Stafford Twp. Address Herschel Corbin, Co. Aud.

✽**Boonville, Ind.**—Bids will be received by the Co. Aud. of Warrick Co., until 10 a. m., July 6, for the construction of broken rock and gravel road in Greer Twp. and Lincoln Ave Rd. in Ohio Twp. Address William A. Campbell, Co. Aud.

✽**Brownstown, Ind.**—Bids will be received by the Co. Aud. of Jackson Co., until 1 p. m., Juyl 6, for the construction of stone and gravel road in Washington Twp. Address Albert Luedtke, Co. Aud.

✽**Covington Ind.**—Bids will be received by the Co. Aud. of Fountain Co., until 2 p. m., July 6, for the construction of gravel and stone road in Millcreek Twp. Address Himan W. Newlin, Co. Aud.

✽**Decatur, Ind.**—Bids will be received by the Co. Aud. of Adams Co., until 10 a. m., July 6, for the construction of macadam road in the following townships: Union, St. Marys, Blue Creek, Jefferson, Hartford and Wabash. Address John Mosure, Co. Aud.

✽**Greenfield, Ind.**—Bids will be received by the Co. Comrs. of Hancock Co. until July 6, for the construction of 2 gravel roads.

✽**Greensburg, Ind.**—Bids will be received until July 5, for grading, draining and paving 12,010 ft. of highway in Decatur Co. Address John C. Barbe, Co. Aud.

✽**Lafayette, Ind.**—Bids will be received by the City Clk. until 7:30 p. m. June 30 for the construction of sidewalks on the west side of 22d St. Address Alfred V. Viol, City Clk.

Mallard, Ia.—Grading and paving planned on 15,000 sq. yd. of streets. Address City Clk.

Danville, Ky.—Extensive street improvements planned. Address City Clk.

Jeffersonville, Ky.—Repairing of city streets planned. Address City Council.

Paducah, Ky.—Hard-surfacing on several streets planned. Address Bd. of Comrs.

✽**Baltimore, Md.**—Bids will be received by State Rds. Comn., until noon, July 6, for gravel road. (See advertisement in this issue of GOOD ROADS.)

Bids will be received by State Rds. Comn.. until noon, July 12, for sheet asphalt paving on reconstructed stone base. (See advertisement in this issue of GOOD ROADS.)

Bids will be received by State Rds. Comn., until noon, July 14, for sheet asphalt paving on reconstructed stone base (See advertisement in this issue of GOOD ROADS.)

Bids will be received by State Rds. Comn., until noon, July 7, for concrete road. (See advertisement in this issue of GOOD ROADS.)

✽**New Madrid, Md.**—Bids will be received by the Co. Clk. of New Madrid Co., until 2 p. m., July 5, for the construction of state road Project No. S18.93, Sec. A, from New Madrid west 19.3 mi. Plans and specifications on file in the office of the Highway Engr. Address C. V. Hansen, Highway Engr.

Boston, Mass.—Bids will be received shortly for asphalt, concrete, bituminous concrete, water bound macadam, granite and wood block paving on number of streets. Address City Clk.

Westfield, Mass.—About $25,000 available for road improvements Address Supt. of Sts.

✽**Bad Axe, Mich.**—Bids will be received by Frank F. Rogers, State Highway Comr., at the office of Bd. of Co. Road Comrs., Court House until 1 p. m., July 14, for bituminous surface treatment of 1.993 mi. of Assessment Dist. Road No. 208, Huron Co. Plans and specifications on file in the offices of the Bd. of Co. Road Comrs., Bad Axe, State Highway Dept., 1-2 Majestic Bldg., Port Huron, and State Highway Dept., Lansing.

Bay City, Mich.—Cement sidewalks planned on 35th and Stanton Sts.

✽**Bellaire, Mich.**—Bids will be received by Frank F. Rogers, State Highway Comr., at the office of the Bd. of Co. Road Comrs. of Antrim Co. until 1:30 p. m., July 8, for shaping, draining and 16-ft. gravel surfacing the following roads: Sec. A, 1.608 mi. in Milton Twp., Sec. B, 5.721 mi. in Torch Lake Twp., Sec. C, 0.511 mi. in Torch Lake Twp. Plans and specifications on file at the offices of the Bd. of Co. Road Comrs., Bellaire, State Highway Dept., Haskins Block, Cadillac, and State Highway Dept., Lansing.

✽**Cadillac. Mich.**—Bids will be received by Frank F. Rogers, State Highway Comr., at the office of the State Highway Dept., Haskins Block, until 1 p. m., July 9, for shaping, draining and surfacing with stone-gravel or slag-gravel, Federal Aid Project No. 6, Sec. F, 1.284 mi., in Burdell Twp., Osceola Co. Plans and specifications on file at the offices of the State Highway Dept., Haskins Block, Cadillac, and State Highway Dept., Lansing. Address Frank F. Rogers, State Highway Comr.

Ecorse, Mich.—Grading, concrete curbing and paving, planned on Mill St.; estimate, $55,000. Address G. Jerome, Engr., 1331 Majestic Bldg., Detroit.

Grosse Points (Detroit P. O.), Mich.—It is planned to expend about $80,000 for grading, shaping, concrete curbing and paving, etc., on Maryland and E. Kercheval Aves. Address T. M. Campau, Engr., 502 Whitney Bldg., Detroit.

✽**Ishpeming. Mich.**—Bids will be received by Frank F. Rogers, State Highway Comr., at the office of the Bd. of Co. Road Comrs., until 10:30 a. m., July 6, for shaping and draining 6.250 mi. of road in Forsyth and Turin Twps., Marquette Co. Plans and specifications on file at the offices of the Bd. of Co. Road Comrs., State Highway Dept., First National Bank Bldg., Escanaba, and State Highway Dept., Lansing. Address Frank F. Rogers, State Highway Comr.

✱**Jackson, Mich.**—Bids will be received by Frank F. Rogers, State Highway Comr., at the office of the Bd. of Co. Road Comrs. of Jackson Co. until 1:30 p. m. July 2, for shaping and gravel surfacing 2.027 mi. of state trunk line road No. 17-1, Parma Twp., Jackson Co. Plans and specifications on file in the offices of the Bd. of Co. Road Comrs., 152 W. Ganson St. Jackson, State Highway Dept., Press Bldg., Ann Arbor and State Highway Dept., Lansing.

✱**Traverse City, Mich.**—Bids will be received by Frank F. Rogers, State Highway Comr., at the office of the Bd. of Co. Road Comrs. of Grand Traverse Co., until 1:30 p. m., July 7, for shaping, draining and 16-ft. gravel surfacing 0.986 mi. of road in Acme Twp. Plans and specifications on file at the offices of the Bd. of Co. Road Comrs., Traverse City, State Highway Dept., Haskins Block, Cadillac, and State Highway Dept., Lansing.

✱**Brainerd, Minn.**—New bids will be received at office of C. W. Mahlum, Co. Aud. of Crow Wing Co; until 4 p. m., July 12, for clearing, grubbing, excavating, graveling, culverts, guard rails, etc. Plans at above office and office of State Highway Dept., St. Paul.

✱**St. Paul, Minn.**—Bids will be received by the Co. Aud. of Ramsey Co., until 10 a. m., July 5, for the improvement of 9,300 ft. of the Mendota Rd. Address George J. Ries, Co. Aud.

✱**Lexington, Miss.**—Bids will be received by the Clk. of the Bd. of Aldermen, until 3 p. m., July 6, for the improvement of the pavement in the Town Square and Yazoo St. Address W. L. Jordan, Clk. of the Bd.

Houston, Mo.—It is planned to improve 28 mi. of road in Texas Co.; estimate, $90,700. Work involves grading, graveling, reinforced concrete bridges and culverts, etc. Address Co. Surv.

Ironton, Mo.—Excavating, graveling, bridges, culverts, etc., planned on 13 mi. of Ironton-Potosi Rd. and 28.5 mi. of Ironton-Piedmont Rd. in Iron Co.; estimates, $116,206 and $243,633, respectively. Address Co. Surv.

Marshfield, Mo.—It is planned to expend about $30,201 for excavating, graveling, culverts, etc., on 8.5 mi. of St. Louis-Springfield Rd. in Webster Co. Address Co. Surv.

St. Louis, Mo.—Brick paving, etc., planned on 2,900 ft. of Natural Bridge Ave. and 3,500 ft. of Morganford Rd.; estimates, $59,050 and $98,600, respectively. Address E. R. Kinsey, Pres., of Bd. of Pub. Serv.

Trenton, Mo.—About $41,146 will be expended for improving 5 mi. of road in Grundy Co. Address Co. Surv.

✱**Helena, Mont.**—Bids will be received by the Executive Committee of the State Highway Comn., at the Capitol Bldg., until 2 p. m., July 2, for the following work:

Federal Aid Project No 36, Powell Co., grading and surfacing 4.12 mi., involving 18,113 cu. yd. excavation, 5,250 ft. B. M. lumber, 104 lin. ft. 8-in. pipe culvert, 48 lin. ft. 24-in. pipe culvert, 5,240 sq. yd. sta. overhaul, 4,235 cu. yd. surfacing, 9.32 cu. yd. class B concrete 78.53 cu. yd. class A concrete, 4,282 lb. reinforcing steel.

Federal Aid Project No. 37, Powell Co., grading and surfacing 5.56 mi. west from Helmsville, involving 20,732 cu. yd. excavation 8,306 cu. yd. sta. overhaul, 114.25 cu. yd. class B concrete, 305.1 cu. yd. class A concrete, 18.1 cu. yd. class C concrete, 30,490 lb. reinforcing steel, 3,650 ft. B. M. lumber, 5,708 cu. yd. surfacing, 6 lin. ft. 12-in. pipe culvert, 56 lin. ft. 15-in. pipe culvert, 206 lin. ft. 18-in. pipe culvert, 104 lin. ft. 24-in. pipe culvert, 26 lin. ft. 30-in. pipe culvert.

Federal Aid Project No. 183, Stillwater Co., grading and surfacing 7.97 mi. between Murill and Columbus, involving 30,527 cu. yd. excavation, 27,647 cu. yd. sta. overhaul, 87.3 cu. yd. concrete, 9,178 cu. yd. surfacing, 2,671 lb. reinforcing steel, 26 lin. ft. 12-in. pipe culvert, 78 lin. ft. 15-in. pipe culvert, 346 lin. ft. 18-in. pipe culvert, 58 lin. ft. 24-in. pipe culvert, 26 lin. ft. 30-in pipe culvert, 38 lin. ft. 36-in. pipe culvert.

✱**Concord, N. H.**—Bids will be received by the State Highway Dept. for the construction of a gravel surfaced road in town of Berlin, estimate, $15,000. Plans and specifications on file in the office of the State Highway Dept., Concord. Address Frederic E. Everett, State Highway Comr.

✱**Freehold, N. J.**—Bids will be received by Bd. of Freeholders of Monmouth Co., until 11 a. m., June 30, for reconstructing Rumson Rd. and Ocean Ave. in Boroughs of Sea Bright and Monmouth Beach. Plans at office of J. Wesley Seaman, Civil Engr., 192 Broadway, Long Branch.

Trenton, N. J.—It is planned to expend about $300,000 for improving 5 mi. of Brunswick Pike, Address H. F. Harris, Co. Engr., of Mercer Co.

✱**Santa Fe, N. M.**—Bids will be received by the State Highway Department until 2 p. m., July 2, for the following work: Federal Aid Project No. 34, Rio Arriba Co., between Chama and Tierra Amarilla, 15.410 mi.; work involves 42,490 cu. yd. class 1 excavation 3,148 cu. yd. class 2 excavation, 1,574 cu. yd. class 3 excavation, 2,500 cu. yd. borrow, 2,000 cu. yd. sta. overhaul, 18,070 cu. yd. 1-course gravel surfacing, 828 lin. ft. 18-in. corrugated metal culvert, 280 lin. ft. 24-in. corrugated metal culvert, 168 lin. ft. 30-in. corrugated metal culvert, 78.38 cu. yd. class B concrete. Plans and specifications on file in the offices of the Dist. Engr., Sante Fe, or the State Highway Engr., Sante Fe. Address L. A. Gillett, State Highway Engr.

Bids will be received by the State Highway Dept., at the Capitol Bldg., until 10 a. m., July 6. for the following work: Federal Aid Project No. 31, Sierra Co., between Elephant Butte Dam and Hot Springs, 3.902 mi.; work involves 21,458 cu. yd. class 1 excavation, 429 cu. yd. class 1 borrow, 7,753 cu. yd. sta. overhaul. 4,578 cu. yd. 1-course gravel surfacing, 1,406 cu. yd. sand-clay base, 22 cu. yd. rip-rap, 276 lin. ft. 18-in. corrugated metal culvert, 112 lin. ft. 24-in. corrugated metal culvert, 17.2 cu. yd. class B concrete—Federal Aid Project No. 47, Grant Co., between Silver City and Cliff, 15.228 mi.; work involves 87,659 cu. yd. class 1 excavation, 1,713 cu. yd. class 2 excavation, 1,531 cu. yd. class 3 excavation 2,480 cu. yd. class 1 borrow, 22,455 cu. yd. sta. overhaul, 16,927 cu. yd. 1-course gravel surfacing, 271 cu. yd. cement rubble masonry, 768 lin. ft. 18-in. corrugated metal culvert, 1,018 lin. ft. 24-in. corrugated metal culvert, 402 lin. ft. 30-in. corrugated metal culvert, 194 lin. ft. 36-in. corrugatd metal culvert, 257 cu. yd. class A concrete, 165 cu. yd. class B concrete, 137 cu. yd. class C concrete, 3,034 lin. ft. expansion joint. Plans and specifications on file at the offices of Dist. Engr., Las Cruces, and State Highway Engr., Sante Fe. Address L. A. Gillett, State Highway Engr.

Bids will be received by the State Highway Comn. until 10 a. m., July 10, for the construction of Federal Aid Project No. 32, San Miguel Co., between Mora and Las Vegas, 15.084 mi.; work involves 95,691 cu. yd class 1 excavation, 2,960 cu. yd. class 3 excavation 8,649 cu. yd. class 1 borrow, 22,275 cu. yd. sta. overhaul, 24,386 cu. yd. 1-course sandstone surfacing 1,576 lin. ft. 18-in. corrugated metal culvert, 428 lin. ft. 24-in. corrugatd metal culvert, 52 lin. ft. 30-in. corrugated metal culvert, 154 lin. ft. 36-in. corrugated metal culvert, 188.4 cu. yd. class B concrete, 12,228 lin. ft. rebuilding fences.

Bids will be received by the State Highway Comn., until 2 p. m., July 10, for the construction of Federal Aid Project No. 33, Mora Co., between Mora and Las Vegas, 12,706 mi.; work involves 90,764 cu. yd. class 1 excavation, 11,822 cu. yd. class 3 excavation, 11,809 cu. yd. class 1 borrow, 39,522 cu. yd. sta. overhaul, 20,279 cu. yd. 1-course gravel surfacing, 300 cu. yd. rip-rap, 396 lin. ft. 18-in. corrugated metal culvert, 604 lin. ft. 24-in. corrugatel metal culvert, 80 lin. ft. 30-in. corrugated metal culvert, 256 lin. ft. 36-in. corrugated metal culvert, 229 cu. yd. class B concrete, 50,490 lin. ft. moving fence line.

Bids will be received by the State Highway Dept. until 2 p. m., July 16, for the construction of Federal Aid Project No. 18, Eddy Co., between Carlsbad and Lea County Line, 32.411 mi.; work involves 75,403 cu. yd. class 1 excavation, 11,991 cu. yd. class 1 excavation, (grader), 12,584 cu. yd. class 2 excavation, 1,144 cu. yd. class 3 excavation, 8,976 cu. yd. class 1 borrow, 8,650 cu. yd. class 1 borrow, (grader), 12,668 cu. yd. sta. overhaul, 186.2 cu. yd. cement rubble masonry, 356 lin. ft. 18-in. corrugated metal culvert, 1,574 lin. ft. 24-in. corrugated metal culvert, 100 cu. yd. 30-in. corrugated metal culvert, 136.04 cu. yd. class B concrete, 74 cu. yd. class C concrete, 2 gates, 2 cattle guards, 1,703 lin. ft. moving fence, (hedge), 47.6 cu. yd. moving fence, (stone), 7,321 lin. ft. moving fence, (wire). Plans and specifications on file in the offices of Dist. Engr., Roswell, and State Highway Engr., Sante Fe. Address L. A. Gillett, State Highway Engr.

Bids will be received by the State Highway Dept. at the Capitol Bldg. until 2 p. m. July 17, for the following work: Federal Aid Project No. 25, Curry Co., East and South of Clovis 15.065 mi.; work involves 50,426 cu. yd. class 1 excavation, 30,916 cu. yd. class 1 borrow, 70,091 cu. yd. sta. overhaul, 20,323 cu. yd. 1-course caliche surfacing, 38 lin. ft. 18-in. corrugated metal culvert, 52.90 cu. yd. class A concrete, 202.4 cu. yd. class B concrete, 1,929.6 lb. expanded metal reinforcement, 3,801 lb. reinforcing bars, 64 lin. ft. 2-in. iron pipe railing—Federal Aid Project No. 24, Roosevelt Co., between Portales and Clovis, 11.365 mi.; work involves 30,640 cu. yd. class 1 excavation, 6,225 cu. yd. class 1 borrow, 36,335 cu. yd. sta. overhaul, 40,004 cu. yd. 1-course caliche surfacing, 6.2 cu. yd. class A concrete, 29.2 cu. yd. class B concrete, 340 sq. ft. expanded metal reinforcement, 210 lb. ½-in. reinforcing bars. Plans and specifications on file in the offices of the Dist. Engr., Santa Rosa, and the State Highway Engr., Santa Fe. Address L. A. Gillett, State Highway Engr.,

✱**Albany, N. Y.**—Bids will be received by State Comn. of Highways until 1 p. m., July 2. for reconstructing and resurfacing roads. (See advertisement in this issue of GOOD ROADS.)

✱**Beach, N. D.**—Bids will be received by the State Highway Comn. and the Bd. of Co. Comrs. of Golden Valley Co., at the Court House, until 10 a. m., July 7, for the construction of Federal Aid Project No. 49, Secs. A and B, 10 mi. of 19.3-mi. earth road improvement; work involves 7.5 acres plowing and harrowing, 44,873 cu. yd. class B excavation, 9,959 cu. yd. sta. overhaul, 998 lin. ft. 15-in., 18-in. and 24-in. pipe culverts, 50.58 cu. yd. class B (1:2½:5) concrete, 168 cu. yd. structural, 170.39 cu. yd. class A (1:2:4) concrete, 11,157 lb. reinforcing steel. Plans and specifications on file in the offices of the State Highway Comn. and Co. Aud.

✱**Cavalier, N. D.**—Bids will be received by the State Highway Comn. and Bd. of Co. Comrs. of Pembina Co., at the Court House, until 1 p. m., July 6, for the construction of Federal Aid Project No. 42, Pembina Co., 5.17 mi. earth road; work involves 1.3 acres clearing and grubbing, 1.3 acres plowing and harrowing, 25,110 cu. yd. class B excavation, 46,851 cu. yd. sta. overhaul, 64 lin. ft. wooden guard rail, 764 lin. ft. 18-in. and 34 lin. ft. 30-in. corrugated metal culverts, 261 cu. yd. structural excavation, 114.84 cu. yd. class A (1:2:4) concrete 19.44 cu. yd. class B (1:2½:5) concrete, 7,657, lb. reinforcing steel, 8.9 lin. ft. w. i. drain pipe. Plans and specifications on file in the offices of the State Highway Comn., Bismark, and Co. Aud.

✱**Lakota, N. D.**—Bids will be received by the State Highway Comn. and Bd. of Co. Comrs., at the Court House, until 10 a. m., July 7, for the construction of Federal Aid Project No. 70, Nelson Co., 5.25 mi. earth road involving 38,503 cu. yd. class B excavation, 11,446 cu. yd. sta. overhaul, 1,730 lin. ft. wooden guard rail, 634 lin. ft. 18-in. and 28 lin. ft. 24-in. pipe culverts, 34.88 cu. yd. class B (1:2½:5) concrete, 406 lb. reinforcing steel. Plans and specifications on file at the offices of the State Highway Comn., Bismark, and Co. Aud.

✱**Washburn, N. D.**—Bids will be received by the State Highway Comn. and Bd. of Co. Comrs at the Court House, until 10:30 a. m., July 9, for the following work: Federal Aid Project No. 63, between Washburn and Wilton, McLean Co., 10 mi. earth road involving 4.0 acres clearing and grubbing, 5.0 acres plowing and harrowing, 91,095 cu. yd. class B excavation, 12,271 cu. yd. sta. overhaul, 4,860 lin. ft. wooden guard rail, 1,184 sq. yd. cobble gutter, 934 lin. ft. 18-in. and 24-in. pipe culverts, 369 cu. yd. structural excavation, 401.00 cu. yd. class A, (1:2:4) concrete, 40.40 cu. yd. class B (1:2½:5) concrete, 59,728 lb. reinforcing steel—Federal Aid Project No. 62A, between Turtle Lake and Underwood, 6 mi. of 10-mi. project, involving 3 acres plowing and harrowing, 39,504 cu. yd. class B excavation, 2, 876 cu. yd. sta. overhaul, 2,340 lin. ft. wooden guard rail, 776 lin. ft. 18-in., 24-in. and 30-in. pipe culverts, 36.32 cu. yd. class B (1:2½:5) concrete, 378 lb. reinforcing steel. Plans and specifications on file in the offices of State Highway Comn., Bismark, and Co. Aud. of McLean Co.

Cuyahoga Falls, O.—Paving of several streets planned. Address Village Clk.

Portland, Ore.—Bids will be received shortly by Bureau of Pub. Rds., 204 Post Office Bldg., Portland, for clearing, grubbing, grading, graveling, bridges, culverts, etc., on 15.9 mi. of road between Tidewater Hill, Lincoln Co. and Benton Co. line.

Philadelphia, Pa.—Widening of Chestnut and 15th Sts. planned. Address Dept. of Pub. Wks.

✱**Providence R. I.**—Bids will be received by the State Bd. of Public Roads, State House, until noon June 30, for the reconstruction of 4.4 mi. of state highway in the towns of Coventry and West Greenwich, between the village of Washington and Nooseneck Hill; work involves 12 acres clearing and grubbing, 27,700 cu. yd. earth excavation, 1,500 cu. yd. ledge excavation, 3,000 cu. yd. gravel foundations, 690 lin. ft. pipe culverts, 11 catch basins, 285 cu. yd. concrete masonry, 1,300 sq. yd cobble gutter, 8,400 lin. ft. wooden guard railing, 9,700 cu. yd concrete pavement. Plans and specifications on file in the office of the State Bd. of Pubic Roads, State House.

✱**Charlestown, S. C.**—Bids will be received by City Engr., until noon, July 6, for the construction of 100,000 sq. yd. sheet asphalt pavement. Address J. H. Dingle, City Engr.

Pierre, S. D.—Bids will be received shortly by State Highway Comn., for grading, draining, graveling, etc., on number of roads.

Ballinger, Tex.—Grading, draining, graveling, etc., planned on 5.7 mi. of road leading north and south from Winters, Runnels Co.; estimate, $44,235. Address Co. Judge.

Mount Pleasant, Tex.—It is planned to expend about $153,791 for graveling, etc. on 11.21 mi. of road in Titus Co. Address Co. Judge.

Paris, Tex.—Grading, curbing, surfacing etc., planned on 6.85 mi. of road leading east and west from this city; estimate, $173,769. Address Co. Judge of Lamar Co.

✱**Montpelier, Vt.**—Bids will be received by the State Highway Comr., until 2 p. m., July 1, for the construction of the following roads: 4.03 mi., bituminous macadam in South Burlington and Shelburne, 4.07 mi., water-bound macadam in New Haven, Waltham and Ferrisburg, 0.71 mi.; water-bound macadam in St. Albans, 0.73 mi., water-bound macadam in Barnet, 13.57 mi., gravel in Dorset, Mt. Tabor and Danby, 5.60 mi., gravel in Dummerston, 1.26 mi., gravel in East Montpelier. Plans and specifications on file in the office of State Engr., Montpelier. Address S. B. Bates, State Highway Comr.

Olympia, Wash.—Bids will be received shortly for grading and concrete paving on 8 mi. of road between Rochester and Grand Mound; estimate, $236,000. Address Co. Clk. of Thurston Co.

Fayetteville, W. Va.—About $75,000 will be expended for 5.2 mi. of bituminous macadam road in Fayette Co. Address J. K. McGrath, Co. Rd. Engr.

✱**Madison, Wis.**—Bids will be received by the State Highway Comn., until 10 a. m., July 6, for the construction of the New Lisbon-Necedah Rd., Juneau Co., Federal Aid Project No. 134; work involves 3.70 acres clearing, 3.91 acres clearing and grubbing, 16,810 cu. yd. excavation, 235 cu. yd. borrow, 17.7 cu. yd. class A concrete, 360 lin. ft. guard rail, 49,568 sq. yd. 16-ft. top soil surfacing.

Bids will be received by the State Highway Comn. at Div. Office No. 8, Spooner, Wis., until 11 a. m., July 6, for grading and paving the Hurley-Ashland Rd., Federal Aid Project No. 178; work involves 8.63 acres clearing, 6.52 acres grubbing, 23,281 cu. yd. earth excavation, 3,418 cu. yd. borrow, 306.6 cu. yd. class A concrete, 2,232 lin. ft. guard rail, 13,556 sq. yd. 24-ft. sand-clay surfacing.

Bids will be received by the State Highway Comn. until 10:30 a. m., July 7, for the construction of Federal Aid Project No. 140, Lake Rd. to River Rd., Iowa Co.; work involves 0.72 acres clearing and grubbing, 45,944 cu. yd. earth excavation, 18,024 cu. yd. rock excavation, 1,105 cu. yd. loose rock excavation, 192 cu. yd. borrow, 455.93 cu. yd. class A concrete, 2 cu. yd. rip-rap, 890 lin. ft. guard rail, 513.9 yd. 24-ft. concrete surfacing, 370 lin. ft. concrete curb.

Casper, Wyo.—It is planned to expend about $30,000 for about 10,000 cu. yd. earth excavation and 75,000 sq. ft. sidewalk. Address City Clk.

Bids Received and Contracts Awarded

Los Angeles, Cal.—Contract for improving 1.4 mi. of San Gabriel Canyon Rd. in Angeles National Forest near Azusa, awarded by C. H. Sweetser, Dist. Engr., U. S. Bureau of Pub. Rds., 886 Mills Bldg., San Francisco, to Bechtel & Hoey, San Francisco, at $95,630.

Evansville, Ind.—Contract for 2.75 mi. of broken rock road awarded by Co. Comrs. of Vanderburgh Co. to John Friday, Evansville, at $59,500.

Elizabeth, N. J.—Contract for paving 12,000 sq. yd. of Westfield and Linden Aves. awarded to Standard Bitulithic Co., 50 Church St., New York, N. Y., at about $100,000.

Trenton, N. J.—Contract for improving road between Rahway and Absecon awarded to Ross & Whalen, Trenton.

Contract for road awarded by State Highway Comn., to Fleming, O'Brien & McEntegert, New York, N. Y., at $248,740.

New York, N Y. (Borough of Richmond)—Contract for repaving Bay St. awarded by Calvin D. Van Name, Boro. Pres., to Craemer & Sachs, 114 E. 42d St., New York City, at $105,277.

Bids received by Calvin D. Van Name, Boro., Pres., May 28, for repaving Richmond Turnpike, rejected. New bids will be received.

Lowest bid received by Calvin D. Van Name, Boro. Pres., June 4, for bituminous macadam repaving on Sunrise Terrace submitted by J. Johnson & Sons, Port Richmond, at $23,138; Van Pelt Ave., J. E. Donovan, 2205 Richmond Terrace, Port Richmond, at $51,093.

Contracts for repaving Boston Rd., Creston, Wales and Clinton Aves. awarded by Henry Bruckner, Boro. Pres., to Asphalt Construction Co., at $38,600, $15,821, $22,398 and $72,617, respectively; E. 166th St., to Uvalde Asphalt Paving Co., 1 Broadway, at $24,234; Tinton Ave., to J. L. Brustarr, Harlem River & 150th St., at $8,755; E. 134th St., to Leonard Paving Co. and C. Helbrock, at $17,500 and $19,905, respectively; E. 183d St., to Astoria Construction Co. and Burnside Construction Co., at $29,851 and $31,348 respectively.

Harrisburg, Pa.—Contract for 18,564 ft. of road in North Milford Boro. and North Milford Twp., Susquehanna Co. awarded by State Highway Dept., to Sprucks & Co., Scranton, at $430,235.14.

Bids received by State Highway Department, May 11, for 27,917 ft. reinforced concrete road in Somerset Co., 34,904 ft. reinforced concrete road in Northampton Co., 6,577 ft. either reinforced concrete or vitrified brick in McKean Co. and 27,642 ft. reinforced concrete and hillside vitrified brick in Delaware Co., rejected.

Seattle, Wash.—Contract for paving 70th Ave. awarded to Olympic Construction Co., at $52,239.

Contract for paving Enumclaw-Franklin Rd. awarded to Independent Asphalt Paving Co., at $64,900.

Chatham, Ont.—Contract for concrete paving on Duke and Princess Sts. awarded by City Council to Geo. Conover; concrete paving on Grant St., to Western Construction Co.

BRIDGES

Bids Asked and Prospective Work

✱**Stocton Cal.**—Bids will be received by the Co. Supvrs. of San Joaquin Co., until July 1, for the construction of 3 bridges; 1 over the Diverting Canal on the Copperopolis Rd., 1 over the Canal on the Lower Sacramento Rd., and 1 over the Mokelumne Riv. on the Acampo-Lockeford Rd. 1 mi. north of Lockeford, estimates, between $75,000 and $100,000 each.

✱**Dover, Del.**—Bids will be received by State Highway Dept., until 2 p. m., July 21, for 2 bridges. (See advertisement in this issue of GOOD ROADS.)

✱**Thomasville, Ga.**—Bids will be received by the Bd. of Comrs. of Roads and Revenues. until July 9, for the construction of 3 reinforced concrete pile and slab bridges, 2 reinforced concrete slab top culverts and 9 pipe culverts with head walls. Address S. L. Hearld, Clk. of Bd.

✱**Alton, Ill.**—Bids will be received by the Dept. of Public Works and Buildings, Div. of Highways, at the Mineral Springs Hotel, Alton, until 2:30 p. m., June 30, for the construction of a steel bridge, reinforced concrete abutments with existing steel superstructure, between Piasa Twp., Jersey Co. and Godfrey Twp., Madison Co.; work involes 154.1 cu. yd. concrete and 8,620 lb. reinforcing steel.

✱**Princeton, Ill.**—Bids will be received by the Dept. of Public Works and Buildings, at the office of the Co. Supt. of Highways, until 2 p. m., July 7, for the construction of a 4-ft. span reinforced concrete culvert in Arispie Twp., Bureau Co.; work involves 18.7 cu. yd. concrete and 1,470 lb reinforcing steel.

Bids will be received by the Co. Supt. of Highways, until 2 p. m., July 7, for the construction of a reinforced concrete culvert, 7-ft. span, 24-ft. roadway, in Indiana Twp., Bureau Co., involving 43.7 cu. yd. concrete, 5,240 lb. reinforcing steel, estimate, $1,320. Address Clarence L. Melcher, Co. Supt. of Highways.

Bids will be received by the Co. Supt. of Highways, until 2 p. m., July 7, for the construction of a reinforced concrete culvert, 4-ft. span, 20-ft. roadway. between Arispie Twp., Bureau Co. and Senachwine Twp., Putnam Co.; work involves 28.3 cu. yd. concrete and 2,710 lb. reinforcing steel.

✱**Springfield, Ill.**—Bids will be received by the Dept. of Pub. Wks. and Bldgs., Div. of Highways, until 10 a. m., July 7, for the construction of the following bridges: Rasmussen Bridge, 10-ft. span, reinforced concrete, estimates, 55.6 cu. yd. concrete, 4,010 lb. reinforcing steel, cost $1,710; Terhune Bridge, 8-ft. span, reinforced concrete, estimates, 28.2 cu. yd. concrete, 2,720 lb. reinforcing steel, cost, $830; Butler Bridge, 8-ft. span, reinforced concrete, estimates, 29.9 cu. yd. concrete, 2,910 lb. reinforcing steel, cost, $850. Address G. F. Burch, Bridge Engr.

Bids will be received by Dept. of Public Works and Buildings, Div. of Highways, until 10 a. m., July 7, for the construction of 3 concrete bridges in Fulton Co., Routes Nos. 14, 17 and 10, estimate, (cement not furnished by Dept.) $3,390. Address Clifford Older, Chief Highway Engr.

Bids will be received by the Dept. of Public Works and Buildings, Div. of Highways, until 10 a. m., July 7, for the construction of bridges on the Vandalia-Cairo Highway, Project No. 14, as follows: Sec. 24B, Fayette Co., 3 concrete bridges, 2 21-ft., 1 50-ft. and 1 22-ft. spans, 372 cu. yd. concrete; Sec. 25B, Fayette Co., 1 steel bridge 1 80-ft span and 1 concrete bridge, 4 20-ft. spans, 328.4 cu. yd. concrete; Sec. 26B, Marion Co., 2 concrete bridges, 1 40-ft. span and 1 24-ft. span, 259.0 cu yd. concrete; Sec. 27B, Marion Co., 1 concrete bridge, 1 40-ft. span and 1 steel bridge, 1 120-ft. span, 467.8 cu. yd. concrete; Sec. 28B, Marion Co., 2 concrete bridges, 1 60-ft. span and 1 50-ft. span, 400.6 cu. yd. concrete; Sec. 29B, Marion Co., 1 concrete bridge, 3 45-ft. spans, 653.1 cu. yd. concrete; Sec. 30B, Marion and Washington Cos., 4 concrete bridges, 1 50-ft., 1 24-ft., 1 16-ft. and 1 16-ft. span, 389.0 cu. yd. concrete; Sec. 31B, Washington Co., 2 concrete bridges, 1 30-ft. and 1 18-ft. span, 187.6 cu. yd concrete; Sec. 32B, Washington Co., 2 concrete bridges, 1 45-ft and 1 20-ft. span, 271.5 cu. yd. concrete; Sec. 33B, 1 concrete bridge, 1 45-ft. span, 172.3 cu. yd. concrete; Sec. 2B, Jackson Co., 1 steel bridge, 2 170-ft. and 1 70-ft. span, 1,100 cu. yd. concrete. Plans and specifications on file at the offices of C. M. Hathaway, Dist. Engr., Record Bldg., Effingham, and L. Schwartz, Dist. Engr., Brush Bldg., Carbondale..

✱**Vandalia, Ill.**—Bids will be received by the Dept. of Public Works and Buildings, Div. of Highways, at the office of the Co. Clk., until 1 p. m., July 3, for the construction of a 12-ft. span reinforced concrete culvert involving 46.1 cu. yd. concrete and 4,310 lb. reinforcing steel. Address J. V. Waddell, Co. Supt. of Highways.

✱**Greenfield, Ind.**—Bids will be received by the Co. Comrs. of Hancock Co. until July 5, for the construction of 5 concrete bridges.

✱**Lansing, Mich.**—Bids will be received by Frank F. Rogers, State Highway Comr., until 1:30 p. m., July 7, for the construction of trunk line bridge No 346, over Rifle Riv. at Selkirk, Churchill Twp., Ogemaw Co.; work involves two 40-ft. concrete girder spans, 18-ft. roadway, one 12-ft. pier and 2 12-ft. abutments containing approximately 336 cu. yd. concrete. Plans and specifications on file in the office of State Highway Comr., Lansing.

✱**Helena, Mont.**—Bids will be received by the Executive Committee of the State Highway Comn., until 2 p. m., July 2, for the construction of a 105-ft. span bridge on concrete piers over the Musselshell Riv., Federal Aid Project No. 116, Musselshell Co., alternate bids required for tubular piers.

✱**Manchester, N. H.**—Bids will be received by the City of Manchester until July 6, for the construction of a bridge to replace the Amoskeag Bridge over the Merrimac Riv., with the proceeds of $160,000 bond issue. Address Michael F. Shea, Director of Public Works

✱**Freehold, N. J.**—Bids will be received by the Bd. of Chosen Freeholders of Monmouth Co., until 11 a. m., July 7, for the Hubbards Bridge No. S17, over the North Shrewsbury Riv. Address William M. Bergen, Director of the Bd.

Santa Fe, N. M.—Bids will be received by the State Highway Comn. until 10 a. m., July 2, for the construction of the Chama Bridge, 12 mi. north of Albiquiu, Rio Arriba Co.; work involves 24,050 ft. B. M. woden superstructure, 4,418 ft. B. M. wooden substructure, 1,032 lin. ft. piling.

Bids will be received by the State Highway Comn., Capitol Bldg., until 2 p. m. July 2, for bridge work on Federal Aid Project No. 34, Rio Arriba Co., involving the following: 27 cu. yd. class A concrete, 117 cu. yd. class C concrete, 2,750 lin. ft. concrete piling, 42,073 ft. B. M, wooden superstructure.

Bids will be received by the State Highway Comn until 2 p. m., July 10, for the construction of bridges on Federal Aid Project No. 33, involving the following materials: 331 cu. yd. class A concorete, 860 cu. yd. class C concrete, 876 sq. ft. exp. metal reinforcement, 15 lb. ¼-in. rd. reinforcing bars, 29,431 lb. ½-in. rd., ⅝-in. rd., ½-in. sq., ⅝-in. sq. reinforcing bars, 20,210 lb. ⅞-in. rd., 1 in. sq. 1-in. rd. reinforcing bars, 5,043 lb. ¼-in. rd. 1⅛-in. rd. reinforcing bars, 764.5 lin. ft 2½-in. W. I. pipe railing.

Bids will be received by the State Highway Comn. until 10 a. m, July 10, for the construction of bridges on Federal Aid Project No. 32, San Miguel Co., involving the following materials: 56.6 cu. yd. class A concrete, 91.3 cu. yd. class C concrete, 687 sq. ft. exp. metal reinforcement, 5,923 lb. ¼-in., ½-in., ⅝-in., sq. and rd. reinforcing bars, 3,813 lb. ⅞-in., 1-in., 1⅛-in. sq. and rd. reinforcing bars, 1,042 lb. 1¼-in. sq. reinforcing bars, 104.5 lin. ft. 2½-in. W. I. pipe railing

Bids will be received by the State Highway Comn. until 2 p. m., July 6, for the construction of the bridges on Federal Aid Project No. 47, Grant Co., involving the following materials: 1,940 lb. reinforcing bars, 936 lin. ft. concrete piling, 1,953 lb. steel substructure, 68,518 ft. B. M. wooden superstructure.

Bids will be received by the State Highway Comn., Capitol Bldg, until 2 p. m., July 16, for the construction of the following bridges on Federal Aid Project No. 18, Eddy Co.; 3,890 ft. B. M. substructure, wood; 2,940 ft. B. M. substructure, wood.

Plans and specifications on file at the offices of the Dist. Engr. and the State Highway Engr., Sante Fe. Address L. A. Gillett, State Highway Engr.

✱**Granville, N. Y.**—Bids will be received by the Town Bd. at the office of the Town Clk., until

2 p. m., July 3, for the construction of a single span concrete arch bridge over Nettowee Riv. on Church St. Plans and specifications on file at the office of Town Clk. Address James N. Mason, Town Clk.

***Cleveland, O.**—Bids will be received by the Co. Aud. of Cuyahoga Co. until June 30, for the construction of a 6x4-ft. concrete box culvert, 200 ft. north of Mayfield, Mayfield Twp. Address W. A. Stinchcomb, Co. Surv.

***Columbus, O.**—Bids will be received by the Bd. of Co. Comrs. of Franklin Co. until July 8, for the construction of bridge No. 70, Plain Twp., Granville Rd., over Rocky Fork Creek; work involves 70 cu. yd. concrete superstructure, 53 cu. yd. concrete substructure, 10,200 lb. reinforcing steel, 4 c. i. scruppers, 166 sq. yd. macadam pavement, 100 cu. yd. excavation and removing old bridge completed. Address Ralph W. Smith, Clk.

***Aberdeen, S. D.**—Bids will be received by the Co. Aud. of Brown Co., until July 6, for the construction of the following bridges: 1 16-ft. beam span, between Secs. 11 and 12, Twp. 121, Range 61; 1 16-ft. beam span, between Secs. 8 and 17, Twp. 126; Range 65; 1 12-ft. and 1 16-ft. beam span, between Secs. 1 and 9, Twp. 128, Range 64; 1 12-ft. span, between Secs. 13 and 24, Range 63, Twp. 125. Address J. J. Roberts, Co. Aud.

***Hayti, S. D.**—Bids will be received at office of A. N. Johnson, Co. Aud. of Hamlin Co., until July 6, for 3 126-ft. span steel bridges and 16 smaller bridges and culverts. Plans at above office.

***Madison, Wis.**—Bids will be received by the State Highway Comn., until 10 a. m., July 6 for the construction of a 45-ft. span, deck girder bridge on the New Lisbon-Necedah Rd., Juneau Co., Federal Aid Project No. 134; work involves 176 cu. yd., class A concrete, and 55 cu. yd. rip-rap

Bids Received and Contracts Awarded

Scottsboro, Ala.—Bids received June 17, for 150,000 sq. ft. of concrete sidewalks, rejected. Address J. W. Woodall, Town Clk.

Globe, Ariz.—Contract for concrete bridges and culverts on Sections A and B of Globe-Geronimo Highway, Gila Co.; awarded to A. W. Daniels.

Cochran, Ga.—Bids received by F. S. Asbell, City Clk., June 15, for about 4,000 cu. yd. excavation, 3,000 lin. ft. concrete curbing and 7,500 sq. yd. concrete paving on 2d St., rejected. Work delayed indefinitely.

Ames, Ia.—Contract for cantilever deck girder bridge awarded to B. Cole, Ames, at $45,258.

Webster Groves (St. Louis P. O.), Mo—Contract for bridge near here awarded to Erick Construction Co., Merchants Laclede Bldg., St. Louis, at $24,268.

Santa Fe. N. M.—Contract awarded by the State Highway Comn. for the construction of the Logan Bridge over the Canadian Riv., Federal Aid Project No. 39, Quay Co., to the Midland Bridge Co., Kansas City, Mo. Bridge is 734 ft. long and includes 1 420-ft. steel arch span.

Columbus, O.—See "Roads and Streets. Bids Received and Contracts Awarded."

Narragansett, R. I.—Contract for bridge over Narrow River awarded by Bd. of Pub. Rds., Providence, to Briggs Engineering & Construction Co.. 75 Westminster St., Providence, at $94,000.

Torrington, Wyo.—Contract for pile bent bridge over North Platte River 2 mi. west of Lingle, Goshen Co., awarded to F. M. Harrington & Son, Ft. Collins, Colo.

BONDS

St. Johns, Ariz.—Issue of $175,000 road bonds voted in Apache Co. Address Co. Engr.

San Anselmo, Cal.—Election planned on $95,000 paving bonds. Address City Clk.

Miami, Fla.—Issue of $350,000 road bonds voted.

Pontiac, Mich.—Election planned July 12 for issue of $1,160,000 street improvement bonds. Address City Clk.

Mehurin, Minn.—Issue of $10,000 bridge bonds will be sold Address Dwight Savage, Town Clk.

Mineola, N. Y.—It is planned to issue $790,000 bonds for road improvements in Nassau Co. Address Co. Supt. of Highways.

Findlay, O.—Issuance of $181,000 for the improvement of the Findlay-Arcadia Rd., authorized by the Co. Comrs. of Hancock Co.

The Dalles, Ore.—Issue of $50,000 bonds voted for west link of Columbia River Highway. Address Co. Judge of Wasco Co.

Lexington, Tenn.—Issue of $350,000 road bonds voted. Address Co. Judge of Henderson Co.

MISCELLANEOUS

Dixon, Ill.—City plans to purchase a street flusher. Address the Mayor.

New York, N. Y. (Borough of Bronx)—No bids received June 2, by H. Bruckner, Pres., for furnishing and delivering 3,000 bags of Portland cement and 200,000 gal. asphalt road oil, estimates, $2,100 and $25,000 respectively.

Notice to Contractors

STATE OF MARYLAND
State Roads Commission
Baltimore, Md.

SEALED PROPOSALS for building the following section of State Highway:

CARROLL COUNTY CONTRACT No. CL-24:

one section of State Highway thru the town of Manchester, for a distance of 0.77 miles. (Concrete).

will be received by the State Roads Commission, at is offices, 601 Garrett Building, Baltimore, Maryland, until 12 M. on the 7th day of July, 1920, at which time and place they will be publicly opened and read.

Bids must be made upon the blank proposal form which, with specifications and plans will be furnished by the Commission upon application and cash payment of $1.00 as hereafter no charges will be permitted.

No bids will be received unless accompanied by a certified check for the sum of Five Hundred ($500) Dollars, payable to the State Roads Commission.

The successful bidder will be required to give bond, and comply with the Acts of the General Assembly of Maryland, respecting contracts.

The Commission reserves the right to reject any and all bids.

BY ORDER of the State Roads commission this 23d day of June, 1920.

J. N. MACKALL, Chairman.
LAMAR H. STEUART, Secretary.

Notice to Contractors

STATE OF MARYLAND
State Roads Commission
Baltimore, Md.

SEALED PROPOSALS for building the following:

Baltimore City Contract BC-37:

Paving Frederick Road from Old City Line to New City Line 1.45 miles of sheet asphalt to be laid on reconstructed stone base.

will be received by the State Roads Commission, at its offices 601 Garrett Building, Baltimore, Maryland until 12 M. on the 14th day of July, 1920, at which time and place they will be publicly opened and read.

Bids must be made upon the blank proposal form which, with specifications and plans will be furnished by the Commission upon application and cash payment of $1.00, as hereafter no charges will be permitted.

No bids will be received unless accompanied by a certified check for the sum of Five Hundred ($500) Dollars, payable to the State Roads Commission.

The successful bidder will be required to give bond, and comply with the Acts of the General Assembly of Maryland respecting contracts.

The Commission reserves the right to reject any and all bids.

BY ORDER of the State Roads Commission this 19th day of June, 1920.

J. N. MACKALL, Chairman.
CLYDE H. WILSON, Secretary.

Notice to Contractors

STATE OF MARYLAND
State Roads Commission
Baltimore, Md.

SEALED PROPOSALS for building one section of State Highway, as follows:

Anne Arundel Contract No. AA-15-A.
Federal Aid No. 34.

One section of State Highway from the State Road near Owensville toward Shadyside, for a distance of 6.00 miles.

GRAVEL

will be received by the State Roads Commission, at its offices 601 Garrett Building, Baltimore, Maryland, until 12 M. on the 6th day of July, 1920, at which time and place they will be publicly opened and read.

Bids must be made upon the blank proposal form which, with specifications and plans will be furnished by the Commission upon application and cash payment of $1.00, as hereafter no charges will be permitted.

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The successful bidder will be required to give bond, and comply with the Acts of the General Assembly of Maryland respecting contracts.

The Commission reserves the right to reject any and all bids.

BY ORDER of the State Roads Commission this 19th day of June, 1920.

J. N. MACKALL, Chairman.
CLYDE H. WILSON, Secretary.

Notice to Contractors

STATE OF MARYLAND
State Roads Commission
Baltimore, Md.

SEALED PROPOSALS for building the following:

Baltimore City Contract BC-36:

Paving Harford Road from Old City Line to New City Line—2.75 miles of sheet asphalt to be laid on reconstructed stone base.

will be received by the State Roads Commission, at its offices 601 Garrett Building, Baltimore. Maryland, until 12 M. on the 12th day of July, 1920, at which time and place they will be publicly opened and read.

Bids must be made upon the blank proposal form which, with specifications and plans will be furnished by the Commission upon application and cash payment of $1.00, as hereafter no charges will be permitted.

No bids will be received unless accompanied by a certified check for the sum of Five Hundred ($500) Dollars, payable to the State Roads Commission.

The successful bidder will be required to give bond, and comply with the Acts of the General Assembly of Maryland respecting contracts.

The Commission reserves the right to reject any and all bids.

BY ORDER of the State Roads Commission this 19th day of June, 1920.

J. N. MACKALL, Chairman.
CLYDE H. WILSON, Secretary.

Notice to Contractors

ADVERTISEMENT FOR PROPOSALS FOR CONSTRUCTION OF TWO STATE HIGHWAY BRIDGES

Sealed proposals will be received by the State Highway Department, at its office, Dover, Delaware, until 2:00 o'clock P. M., July 21, 1920, and at that place and time publicly opened for the construction of two State Highway Bridges at Frederica, in Kent County, Delaware, involving the following approximate quantities:

CONTRACT 24-A
Murderkill River Bridge
Encased I-Beams with Reinforced Concrete Floor

420	cu. yds. Wet Excavation.
600	cu. yds. Class A Concrete
25000	pounds Reinforcement.
75000	pounds 20 in. 65-lb. I-beams.
3500	pounds ½ in. Bearing Plates.
8600	lin. ft. Timber Piles
125	tons Slag Fill on Bridge Floor.

Spring Creek Bridge
Encased I-Beams with Reinforced Concrete Floor

210	cu. yds. Wet Excavation.
220	cu. yds Class A Concrete
13000	pounds Reinforcement.
38000	pounds 20 in. 65-lb. I-beams.
2000	pounds ½ in. Bearing Plates.
5400	lin. ft. Timber Piles
63	tons Slag Fill on Bridge Floor.

In each bridge the estimated length of piles below the cut-off is 50 feet. The actual length is

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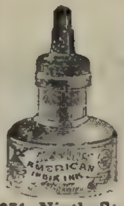

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to be determined by Test Piles driven by contractor.

Performance of contract shall commence within ten (10) days after execution of the contract and be completed on or before December, 31, 1920.

Monthly payments will be made for 90 per cent. of the construction completed each month.

Bidders must submit proposals upon forms provided by the Department.

Each proposal must be accompanied by a surety bond, certified check or money to the amount of at least ten (10) per cent. of the total amount of the proposal.

The envelope containing the proposal must be marked: "Proposal for the construction of Two State Highway Bridges under Contract No. 24-A."

The contract will be awarded or rejected within twenty (20) days from the date of opening proposals.

The right is reserved to reject any or all bids.

Detailed plans may be seen, and index plans and specifications may be obtained upon deposit of ten dollars ($10.00) which amount will be refunded upon return of plans and specifications in good condition at the office of

STATE HIGHWAY DEPARTMENT
DOVER, DELAWARE
Chas. M. Upham, Chief Engineer.

Notice to Contractors

STATE OF MARYLAND
State Roads Commission
Baltimore, Md.

SEALED PROPOSALS for building one section of State Highway, as follows:

BALTIMORE CITY CONT. No. Bc34: Paving Philadelphia Road from end of sheet asphalt to New City Line for a distance 2.1 miles of sheet asphalt to be laid on reconstructed stone base, will be received by the State Roads Commission, at its offices, 601 Garrett Building, Baltimore, Maryland, until 12 M. on the 6 day of July, 1920, at which time and place they will be publicly opened and read.

Bids must be made upon the blank proposal form which, with specifications and plans will be furnished by the Commission upon application and cash payment of $1.00, as hereafter no charges will be permitted.

No bids will be received unless accompanied by a certified check for the sum of Five Hundred ($500) Dollars, payable to the State Roads Commission.

The successful bidder will be required to give bond, and comply with the Acts of the General Assembly of Maryland, respecting contracts.

The Commission reserves the right to reject any and all bids.

BY ORDER of the State Roads Commission this 18 day of June, 1920.

J. N. MACKALL, Chairman.
CLYDE H. WILSON, Secretary

Notice to Contractors

STATE OF MARYLAND
State Roads Commission
Baltimore, Md.

SEALED PROPOSALS for building the following:

BALTIMORE CITY Contract BC-35: Paving Belair Road from Old City Line to Hamilton Avenue. 1.94 miles of sheet asphalt to be laid on reconstructed stone base will be received by the State Roads Commission, at its offices, 601 Garrett Building, Baltimore, Maryland until 12 M. on the 7th day of July, 1920, at which time and place they will be publicly opened and read.

Bids must be made upon the blank proposal form which, with specifications and plans will be furnished by the commission upon application and cash payment of $1.00, as heeafter no charges will be permitted.

No bids will be received unless accompanied by a certified check for the sum of Five Hundred ($500) Dollars, payable to the State Roads Commission.

The successful bidder will be required to give bond, and comply with the Acts of the General Assembly of Maryland, respecting contracts.

The Commission reserves the right to reject any and all bids.

BY ORDER of the State Roads Commission this 18th day of June, 1920.

J. N. MACKALL, Chairman.
CLYDE H. WILSON, Secretary

Notice to Contractors
HIGHWAY WORK

STATE COMMISSION OF HIGHWAYS
Albany, N. Y.

SEALED PROPOSALS will be received by the undersigned at their office, No. 55 Lancaster Street, Albany, N. Y., at 1 o'clock P. M. on Friday, the 2d day of July, 1920, for the reconstruction and resurfacing of the following:

ALBANY	(one contract)
COLUMBIA	(one contract)
DUTCHESS	(one contract)
FULTON	(one contract)
GREENE	(one contract)
LEWIS	(one contract)
ONEIDA	(one contract)
RENSSELAER	(one contract)
ULSTER	(one contract)
WARREN	(one contract)

Maps, plans specifications, estimates and proposal forms may be obtained at the office of the Commission in Albany, N. Y., and at the office of the division engineers in whose division the roads to be reconstructed are located. The addresses of the division engineers and the counties of which they are in charge will be furnished upon request.

The especial attention of bidders is called to "General Information for Bidders" on the itemized proposal, specifications and contract agreement.

FRED'K STUART GREENE,
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1 Marion, Model 28, ⅝ yd. dipper
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1 22 ft. Lakewood, boom and bucket.
1 18 ft. Chain Belt, boom and bucket.
1 14 ft. Koehring, boom and bucket.

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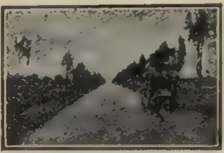

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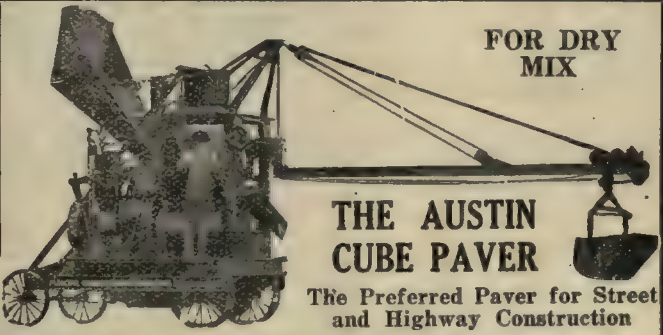

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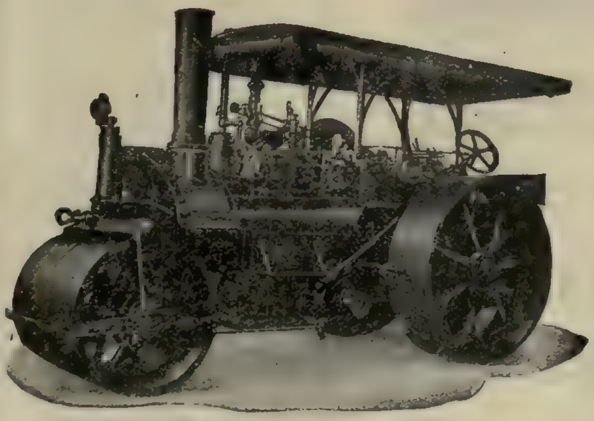

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